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Exploring Community Perceptions of Rural Wastewater Treatment Development

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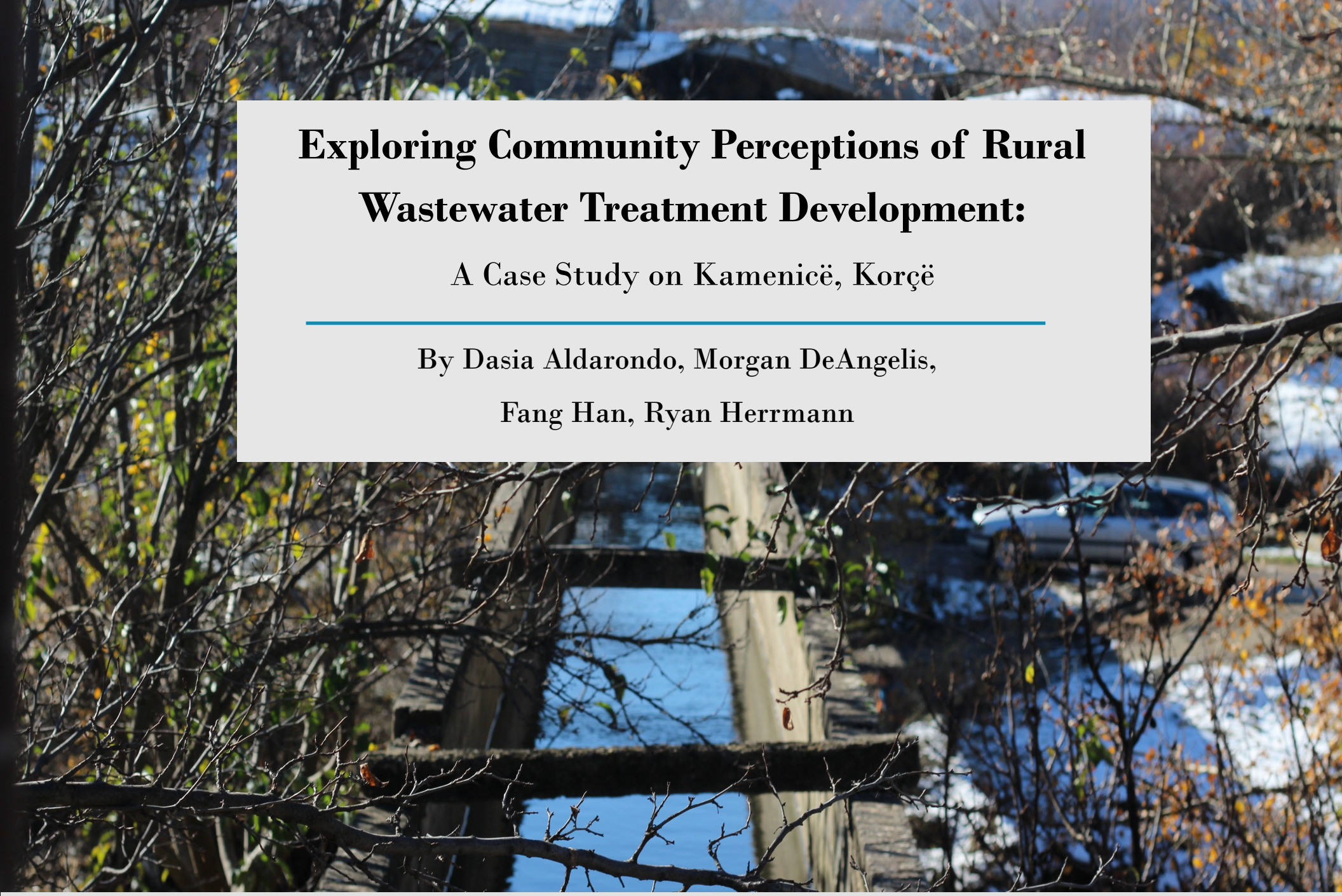

Exploring Community Perceptions of Rural Wastewater Treatment Development:

A Case Study on Kamenicë, Korçë

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WPI

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Abstract

Kamenicë, a rural village in Korçë, Albania, currently lacks a formalized wastewater treatment system. The water utility UKKO, sponsor of this project, has recently been tasked with providing wastewater treatment services to the community. Framed as a case study, this project explored the perceptions of residents towards the potential development. Expert interviews, participatory mapping, and photo documentation were used to understand the village's geographic characteristics. Interviews with residents and other community members provided insight into Kamenicë's history, culture, and socioeconomics as well as people's experiences, perceptions, and opinions of wastewater. The resulting case study can be referenced to supplement social considerations of wastewater treatment development.

Acknowledgements

We so grateful to all the people who helped us throughout our time in Albania. We would like to extend our appreciation to the following people who made this successful project possible:

- Professor Leslie Dodson, our IQP advisor
- Professor Robert Hersh, our IQP advisor and co-director of the project site
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- SHUKALB and its Executive Director, Elisabeta Poçi
- Gent Gjuta, our project site liaison
- Sotiraq Filo, Mayor of the Korcë Municipality
- The community of Kamenicë
- The community of Dvoran
- Professor Frederick Bianchi, our PQP advisor
- Lori Steckervetz, our WPI librarian

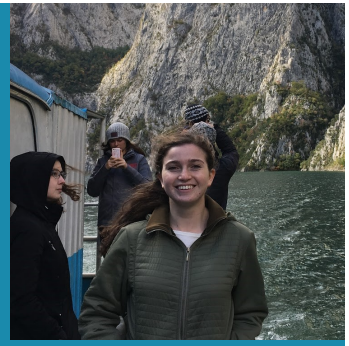
Our memorable eight weeks in Tirana and Korçë have been a true pleasure. The “Korçë Kids” have thoroughly enjoyed our time here and would like to express our thanks to all those who assisted us in our project and helped shape our wonderful experiences.

Authorship

As there have been multiple revisions of sections of this report, it is difficult to clarify authorship on all sections. We will instead detail our writing, revising, and editing process. Sections of a chapter were divided so that there was a single, preliminary author for each. After the completion of a first draft, the entire project team read through each section and performed suggestive editing. After the suggestive editing process, the team as a whole addressed any major concerns through a face-to-face discussion. The original, preliminary author then accepted (or, in some cases, rejected) edits and made alterations. Many of these rounds of editing resulted in the reorganization of some sections and subsections. At this stage, a second draft was produced, and this draft was reviewed by each member of the team. Direct edits were made during this process, and any final major concerns were identified and discussed; the end product of this stage of revising and editing was the final draft. The reason that authorship is difficult to define is because our report has undergone many content-related and structure-related revisions, resulting in new and combined sections. In these changes, text from past sections was often borrowed and reorganized into different sections, making it impossible to track the original author.

Meet the Team

Hello! I'm Dasia Aldarondo and I am a chemical engineering student at WPI. I am originally from Fitchburg, Massachusetts, USA. During my 14 weeks working on this problem I have learned many invaluable skills such as how to conduct an interview, what makes a follow up question, and how to present social findings. Working in Kamenicë was an experience I will hold with me forever. The village was beautiful, with well-constructed houses. The residents were all very warm and welcoming and I got a true sense of what the community was like as a whole.



Hi, I'm Morgan DeAngelis. Originally from Mountain View, California, I am an environmental engineering student at WPI. I have felt so lucky to be able to complete my IQP at this project center. All of the people that we have met here, both UKKO representatives, and residents of Kamenicë have been continuously welcoming and supportive of our project work. I feel like I have been able to grow both personally and academically throughout this experience and I am very grateful for the opportunity to do so.

Greetings! My name is Fang Han. I am originally from Beijing, China, but I have lived in Grafton, Massachusetts, for almost ten years. Currently, I am an undergraduate student at WPI majoring in mechanical engineering and minoring in business. Although my time in Albania was full of fascinating experiences, I will certainly never forget the hospitality of the people of Kamenicë. The community welcomed us with open doors, greeted us with sincere smiles, treated us to delicious foods and drinks, and embraced us with warm hugs. I am truly grateful for these memories.

My name is Ryan Herrmann, and I am from Nashville, Tennessee. I am pursuing a double major in mechanical engineering and management engineering at WPI. I have thoroughly enjoyed my work on this project. In particular, I appreciated getting to meet so many interesting people: in the village, in water utility, in the government, not to mention all the waiters, students, and strangers that I had the opportunity to meet on a day to day basis. Getting to interact with such a variety of new faces was a real pleasure and greatly enhanced my IQP experience.

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Executive Summary

Untreated or improperly treated wastewater can contain organic and inorganic pollutants that are dangerous to public and environmental health (Aktar, 2009). In Albania, only 12.5% of the country's 1.2 million rural residents have access to wastewater treatment services (The World Bank, 2015). Ujësjellës Kanalizime Korçë (UKKO) is the water utility company of the Municipality of Korçë and is tasked with providing both water supply and wastewater treatment to the region. Due to recent territorial and administrative reforms initiated by the Albanian government, the service area of UKKO has been expanded to include 63 villages surrounding the city of Korçë, one of which is the village of Kamenicë.

Located 11 kilometers southwest of the city of Korçë, Kamenicë sits at the edge of the Korçë basin. The northern portion of the village consists of flat, agricultural land, but to the south, the terrain becomes hillier and more complex (*Figure 1).* Kamenicë is home to 1,400 residents in 460 households (Posch & Partners Consulting Engineers et al., 2017). The economy of the village is largely agricultural, with a high production of apples and cherries. Kamenicë consists of multiple distinct geographic regions as well as two major waterways. The terminology that we use to refer to these regions are: Old Kamenicë, Lower Kamenicë, and Center Kamenicë. The two major waterways are the village stream which runs from the southeast to the northwest and the Gjanç, a river that flows through Lower Kamenicë from the southwest to the northeast.

In the 1990s, the new democratic government divided village land into plots, which were then awarded to families based on household size. People were then free to build new homes on their private properties. This opportunity resulted in a migration out of the older parts of the village down to these land plots where new houses have been built. Approximately 100 families have moved out of Old Kamenicë since the 1990s, and only 20 households remain inhabited in Old Kamenicë today. It is also common for young people to leave the village and pursue opportunities elsewhere, most often in Ti-

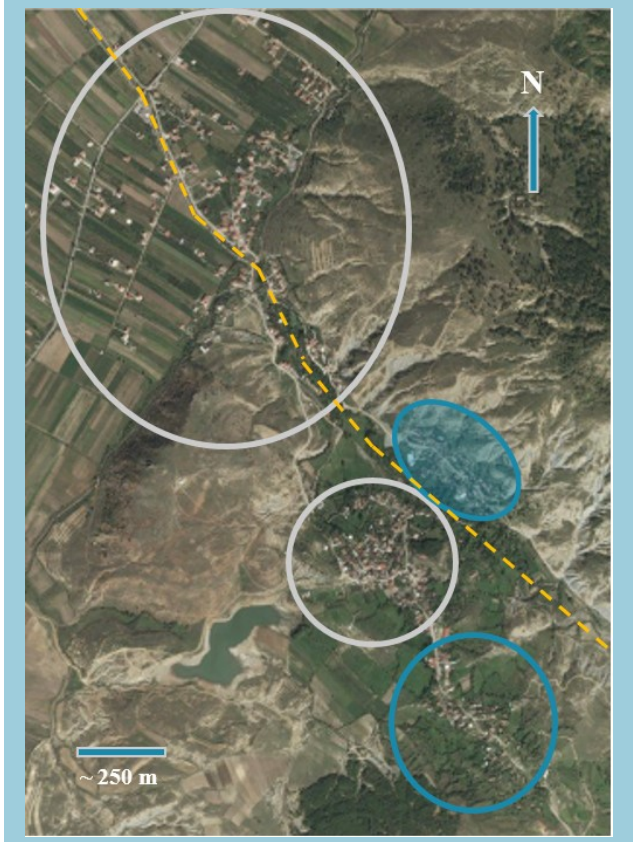

Figure 1. Map of Kamenice

Adapted from Bing Maps (2017).

rana and Greece.

Many of the houses located in Old and Center Kamenicë, away from the village stream, utilize self-built septic tanks which consist of hand-dug pits lined with concrete, wood, or dirt, with a base-layer of gravel. These are gravity septic tanks which either let filtered water disperse in the soil just underneath or get piped out to the village stream. Most residents clean out the sludge from their septic tank once every few years, and many of them dry the sludge and mix it with animal manure to use as fertilizer. In contrast, the newer houses in Lower Kamenicë are closer to the village stream and sometimes forego the use of septic tanks to instead discharge their wastewater directly into the stream.

UKKO's plan for new water supply infrastructure in Kamenicë has been approved by the municipality, and implementation is projected to begin in Spring 2018 and take one year. Wastewater treatment development will follow the water supply project pending sufficient funding and the approval of proposed plans. Currently, UKKO plans to install a cluster system in Kamenicë consisting of a series of several large septic tanks shared by 40 to 50 households. Wastewater from homes would be transported via underground pipes to these shared septic tanks, which are then cleaned out by UKKO once every one to three months. Collected water would be discharged into the main village stream, and sludge would be transported to the neighboring village of Dvoran, where UKKO intends to construct a professional treatment plant. Kamenicë residents connected to the new system would pay a disposal fee, which has yet to be determined.

With the goal of assessing the current state of wastewater treatment and its development in Kamenicë and understanding the associated social perceptions, we developed a case study on the community. We studied the experiences of residents in Kamenicë during a period of community development and followed research questions to guide our study. Those questions are:

1. How do Kamenicë residents describe their experiences living in a village without organized wastewater treatment during a period of community development?
2. In what ways is the community developing?

3. How does UKKO plan to develop organized wastewater treatment for the village?
4. How do the experiences of residents influence their perceptions on future wastewater treatment development?
5. How do these perceptions influence their opinions on future wastewater treatment development?

We addressed these research questions through expert interviews, archival research, community interviews, participatory mapping, and photo documentations.

Expert interviews with UKKO employees, the mayor of the Municipality of Korçë, and the executive director of the Water Supply and Sewage Association of Albania (SHUKALB) allowed us to develop an understanding of water service projects in Kamenicë and UKKO's role in the planned wastewater treatment project. To evaluate the feasibility of UKKO's plans from a social perspective and to build strong context in our case study, we conducted archival research using technical and financial documents on the company's proposed plan for developing wastewater treatment infrastructure.

Semi-structured interviews conducted with local residents allowed us to enhance the context within our case study as well as gain insight into the perceptions of community members on wastewater.

We conducted participatory mapping activities with two UKKO employees who work directly in the village as water meter readers. This activity, which asked participants to label regions and main waterways within the village, highlighted the ways in which the commu-

nity is developing and served as a guide for where we selected potential interviewees. Another version of the participatory mapping activity done by an UKKO hydraulics engineer gave us more insight into the wastewater plan UKKO is proposing, as it asked the participant to label the number and locations of the septic tanks required for the system.

Finally, to keep an authentic record of our observations, we used photo documentation throughout our fieldwork in Kamenicë. The photographs we collected aided us in establishing the physical setting of our case study.

Our approach to the case study allowed us to receive full and significant findings in the form of stories and data points from the 13 households we interviewed. Through these interviews, we learned about the history, economy, and demographics of Kamenicë as well as experiences and opinions toward wastewater.

We found a general desire to develop better infrastructure throughout the village, including a sewer system and paved roads. The majority of residents we spoke with accepted that construction in the neighborhood and on personal property is a necessary condition to community improvement. It should be noted that some residents grow crops on their property that are sold as a source of income, and construction on such property could result in the loss of income.

Every head of household we interviewed expressed a willingness to pay a "fair" tariff for the maintenance of a treatment service, but some residents warned that other members of the community would not or could not pay an additional tariff for wastewater treatment services. Some residents believe that a system of shared septic tanks is not the best solution for the community, instead hoping for a centralized system. Others see wastewater treatment as a lower priority as they would like to see investment into the paving of more village roads instead.

UKKO representatives categorized the environmental risk of the contaminated village stream as low, since it does not connect to any large bodies of water; however, there were residents who reported seeing dead fish in the river. Residents did not report any current health issues related to wastewater exposure, although many expressed concern about potential exposure.

This study encompasses Kamenicë's strive for progress and can be applied to future situations where the village may experience infrastructure improvement. In addition, the questions we asked and processes we took can be adapted by utility companies interested in learning about the social perceptions of a community before beginning infrastructure development.

It may be instructional for UKKO and other utilities to observe how the community is dealing with the current wastewater storage, treatment, and disposal situation, to be aware of how construction would affect the community, and to gauge the demographics, distribution of wealth, and motivations of residents. By doing this, a utility can gain insight into the urgency residents feel for development, their willingness to accept and pay for the service, and how much resistance a project may face. The utility can then adjust the project plan or any educational campaigns to the needs of the resident.

The purpose of this case study is to highlight that when a utility company creates plans to construct new infrastructure, there is more to be considered than where the structure will physically go and how it will be funded. The lives of individuals in a community are severely impacted by these kinds of changes. It is necessary to ensure that the basis for the plan be developed keeping in mind the lives, needs, and desires of community members in order to implement a successful wastewater treatment system that serves the community.

Picture across stream of Lower Kamenicë.

Introduction

“80% of wastewater world wide does not undergo proper treatment”

The United Nations Environmental, Scientific and Cultural Organization estimates that only 20% of wastewater worldwide undergoes proper treatment. Untreated or inadequately treated wastewater, whether from homes, farms, factories, etc., can contain large amounts of organic and inorganic pollutants which can be harmful to humans, agriculture, and the ecosystem. Threats such as waterborne disease often have fatal consequences for exposed communities (WHO, n.d.); an estimated 1.8 million children under five years of age die each year in developing countries due to improper wastewater treatment (Saad et al., 2017). Moreover, a population can be exposed to wastewater pollutants through both direct contact, such as interaction with contaminated surface water, and indirect contact, such as the consumption of contaminated foods (National Small Flows Clearinghouse [NSFC], 1996).

The dangers of inadequate wastewater treatment are particularly severe in parts of rural Albania. Estimates indicate that only 12.5% of the rural population in Albania has access to wastewater treatment services (The World Bank, 2015). This means that of the 1.2 million Albanians living in rural areas (Central Intelligence Agency [CIA], 2017), over one million lack access to sufficient wastewater treatment, leaving the disposal of their agricultural and domestic wastewater up to themselves. One of the key challenges that Albania faces is the lack of technical and financial resources in the water sector, which hinders proper operation and maintenance of wastewater treatment systems (The World Bank, 2015).

Water supply and sewage services are taking on increased importance as the country undergoes a series of territorial and administrative reforms (The World Bank, 2015; United Nations Development Programme [UNDP], n.d.-a). The Ujësjellës Kanalizime Korçë (UKKO), water utility company of the Korçë municipality, is taking part in this effort by expanding its service coverage from the city of Korçë to include 63 surrounding villages. This expansion will result in the addition of approximately 40,000 customers to a program that currently serves 65,000. UKKO has asked our team to assess the current state of wastewater treatment in the recently added village of Kamenicë and to evaluate the social perceptions of community members regarding wastewater (A. Ibrahimllari, personal communication, September 27, 2017).

We developed a case study of the village of Kamenicë by analyzing the social perceptions of wastewater disposal in the community from the perspectives of technical and economic understanding, geographic capabilities, and attitudes, knowledge, and motivations of the residents. In order to assess the opinions and dispositions of village residents, we interacted with and interviewed local officials and community members. To ensure that we were able to analyze the social perspectives of wastewater disposal in the proper context, we gained a thorough understanding of UKKO's preliminary wastewater treatment plan. Finally, to supplement and contextualize our social findings, we conducted numerous on-site interviews and observations to better understand the community's history and culture and existing wastewater systems. Addressing these aspects of wastewater treatment development with an emphasis on the social dimension allowed us to create a case study that illuminates some of the social perceptions in Kamenicë, which UKKO can reference to help inform their planning process and highlight the importance of participatory planning in areas of expansion.

Sign outside of Bashkia Korçë


Arial view of Korçë City


FUCHS
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Background

Any desire for a clean, steady supply of water should be coupled with a genuine concern for what happens to *used* water. If not properly collected, stored, and treated before discharge, wastewater can have severe consequences on public and environmental health. The development of wastewater treatment projects involves a number of technical and non-technical considerations including geographic limitations, local economics, and social attitudes. Access to proper wastewater treatment is a challenge for many communities across the globe, especially in developing countries and rural regions. One such case is in Kamenicë, Korçë, where the local water utility company is facing the task of implementing an effective wastewater treatment system for the community.

In this Section:

1. Albania and its Water Utilities Sector

1.1 Challenges Faced by the Albanian Water Utilities Sector

The Albanian water supply and sewerage services sector consists of 57 utilities all operating as joint stock companies wholly owned by local government entities (Albanian Water Regulatory Authority [ERRU], n.d.). According to the World Bank (2015),

> *[Albanian] water utilities are not sufficiently complying with the principles of cost control, continuous efficiency improvement, and full cost recovery, causing a vicious circle of underfunded service providers, insufficient investment, and deteriorating infrastructure, in particular for wastewater management (The World Bank, 2015).*

Data from 2013 showed that water supply services were available to 90% of the urban population and 59% of the rural population, and while wastewater treatment services were available to 84% of the urban population, only 12.5% of the rural population had access to such services (*Figure 2) (The World Bank, 2015).* Yet, 40% of Albania's three million citizens live in rural regions *(CIA, 2017).*

Studies conducted between 2006 and 2009 revealed a negative trend in water quality due to exposure to domestic and commercial effluents (Manjani et al., 2011). Wastewater treatment is expected to improve significantly in the near future as portions of the state budget as well as external grants and loans are funding the construction of new plants (ERRU, n.d.; World Bank, 2015). Albania has been a European Union (EU) candidate since 2014 (CIA, 2017), and development of the wastewater sector would improve the country's compliance with EU standards (European Commission, 2010).

Albania's National Strategy of Water Supply and Sewerage, 2011-2017, seeks to improve the performance of the water services sector. One of the program objectives is to decentralize government control over water utility companies and to transfer this control to local government entities. The program also emphasizes that internal migration within the country is projected to continue, with many migrants settling in rural areas surrounding urban centers. With regard to funding issues, sector inefficiencies like low tariffs and low bill collection rates are expected to continue to result in operating costs not being fully covered; as of 2011, total cost coverage within the sector was only 56.1%, and household customers have the lowest tariff collection rate (Manjani et al., 2011). Surveyed citizens believe that the water sector is poorly managed and has an obsolete network. Furthermore, Albanian public service providers have traditionally failed to communicate and engage with customers (Hoxha et al., 2012).

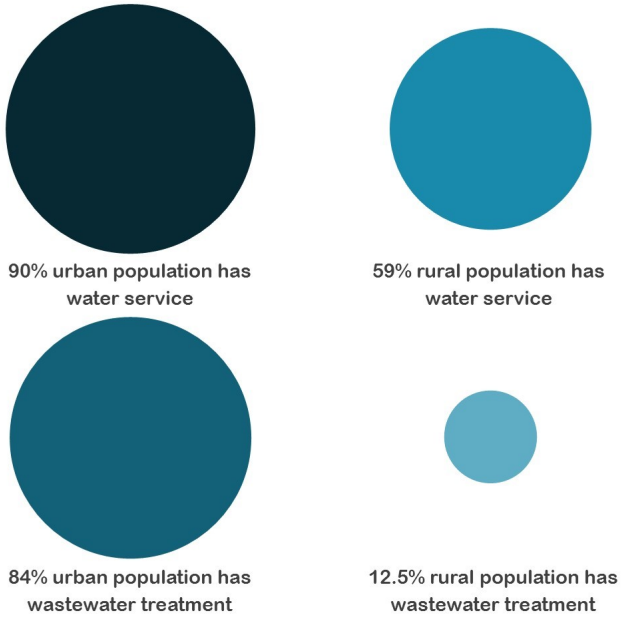


Figure 2: Service Status of the Albanian Water Sector

Adapted from *(The World Bank, 2015).*

1.2 Ujësjellës Kanalizime Korçë (UKKO)

The Korçë municipality is located in southeastern Albania within Korçë County. Lying 850 meters above sea level, the municipality sits on a fertile plateau surrounded by the Morava mountains (Encyclopædia Britannica, 2017). The municipality consists of a collection of administrative units, including the city of Korçë.

The Ujësjellës Kanalizime Korçë (UKKO), or Korçë Water Utility, is a 100% state-owned joint stock company owned by the government of the Municipality of Korçë. The nonprofit utility is charged with providing a safe, sustainable, and adequate water supply to residents of the Korçë municipality and ensuring the proper collection and treatment of wastewater as a means to preserve public and environmental health (UKKO, n.d.-a). UKKO supplies drinking water; maintains drinking water supply systems; purchases and provides water according to consumer demand; collects, removes, and treats wastewater; and maintains wastewater treatment systems. It currently provides services to approximately 65,000 residents living within in the Municipality of Korçë and the nearby villages of Turan and Çiflig. The wastewater treatment system currently covers 93.9% of customers living within this service area, and the management team plans to expand coverage (UKKO, n.d.-b).

The water supply system operated by UKKO is a 185.5-kilometer long network of reservoirs, wells, and collection tanks (UKKO, n.d.-b). In the past, the water supply in Korçë city was active for only four to six hours per day, but service is now provided 24/7 (The World Bank, 2015). The current system is sufficient to reach most of the Municipality of Korçë as well as the two aforementioned villages (UKKO, n.d.-b).

Wastewater is transported to a treatment plant located 2.5 kilometers north of the city of Korçë. In use since 2012, this 13-hectare plant has the capacity to treat wastewater produced by 85,000 residents. It consists of air-fed systems and treatment ponds and allows for the treatment of sludge for use in agriculture (UKKO, n.d.-b).

In its 2015 report, the World Bank describes UKKO as “the leading water supply and sewerage company in Albania” and “one of the most successful utilities in the Western Balkans.” UKKO is working towards:

- Ending the unsanitary discharge of wastewater in rural areas;
- Building small-scale wastewater treatment plants in rural areas;
- Improving rainwater treatment;
- Improving sludge treatment (Tare, 2016).

Picture of an UKKO manhole cover in Korçë city.

Picture of aerator from UKKOs’ facility in Korçë city

1.3 Wastewater Treatment in Villages of the Korçë Region

In 2013, the Government of Albania began the implementation of administrative and territorial reforms with the goal of reorganizing local government units (LGUs). The initial program, known as the Support to Territorial and Administrative Reform (STAR), concluded in June 2016 with the reduction of the number of LGUs from nearly 400 to only 61 municipalities (UNDP, n.d.-a). The successor of the STAR program, the Consolidation of Territorial and Administrative Reform (STAR2), is scheduled to continue into 2019; its purpose is to ensure the proper functioning of the newly established LGUs and to expand the coverage of public services to rural and suburban regions nationwide (UNDP, n.d.-b). The Delegation of the European Union to Albania is funding STAR2 with EUR 3.5 million (UNDP, 2016).

As a result of STAR and STAR2, UKKO's service area was expanded to 63 villages surrounding the city of Korçë, adding approximately 40,000 new customers. This expansion necessitated an assessment of present wastewater circumstances in these villages in order to develop, repair, or upgrade treatment systems (A. Ibrahimllari, personal communication, September 27, 2017). One of the expansion sites is Kamenicë, which is located 11 kilometers southwest of the city of Korçë (*Figure 3)*.

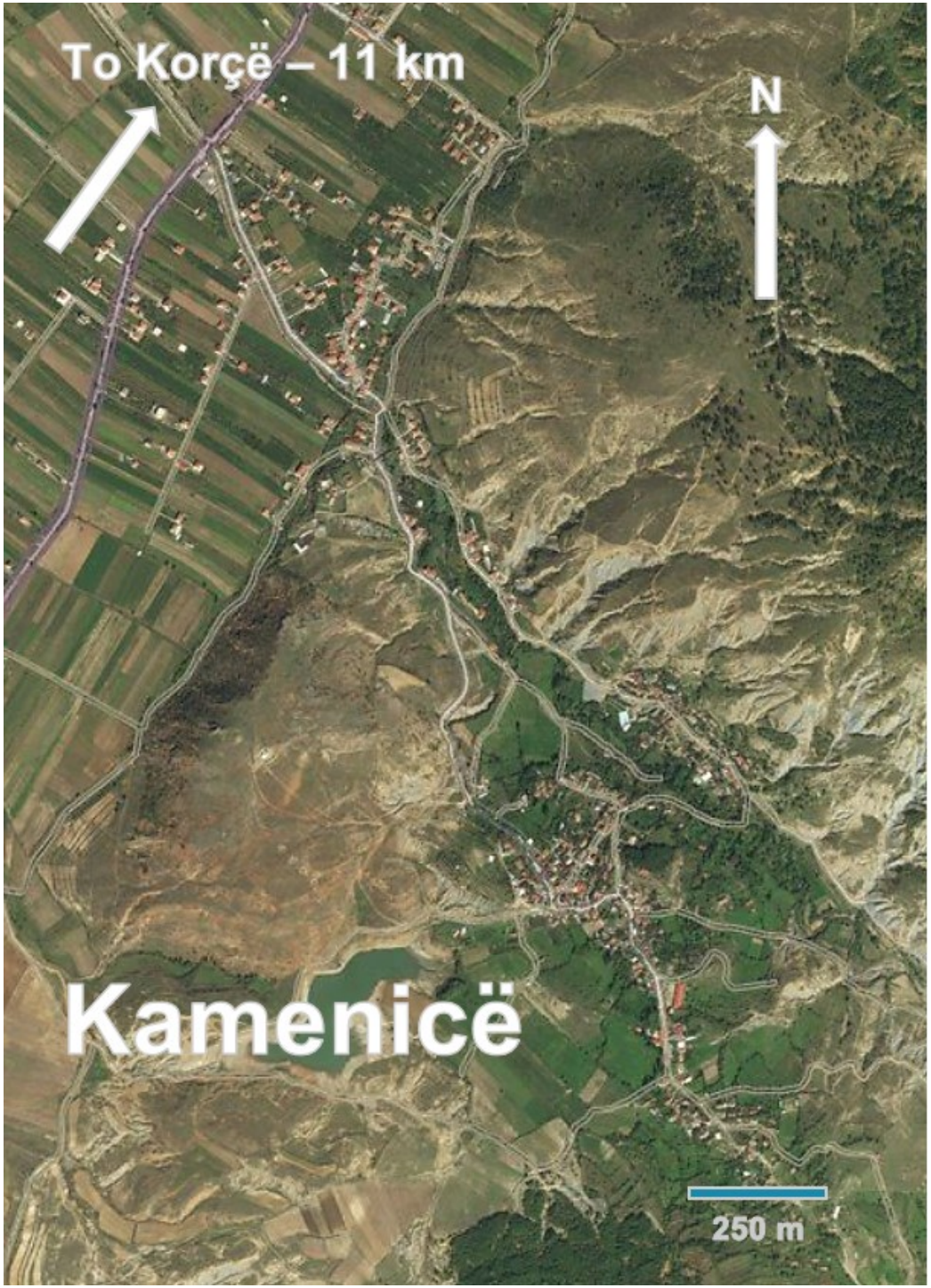


Figure 3. Satellite Map of Kamenicë

Adapted from Bing Maps (2017).

A 2017 feasibility study conducted by four consulting companies addressed the current water supply conditions and wastewater collection infrastructure in Kamenicë (*Figure 4)* as well as some of the options for wastewater treatment within the village. Importantly, it was found that no piped sewer system exists in Kamenicë. Some residents (14%) use small, unregulated, and unmonitored on-site sanitation infrastructure; others dispose of their wastewater onto land or into open channels (*Figure 5)*.

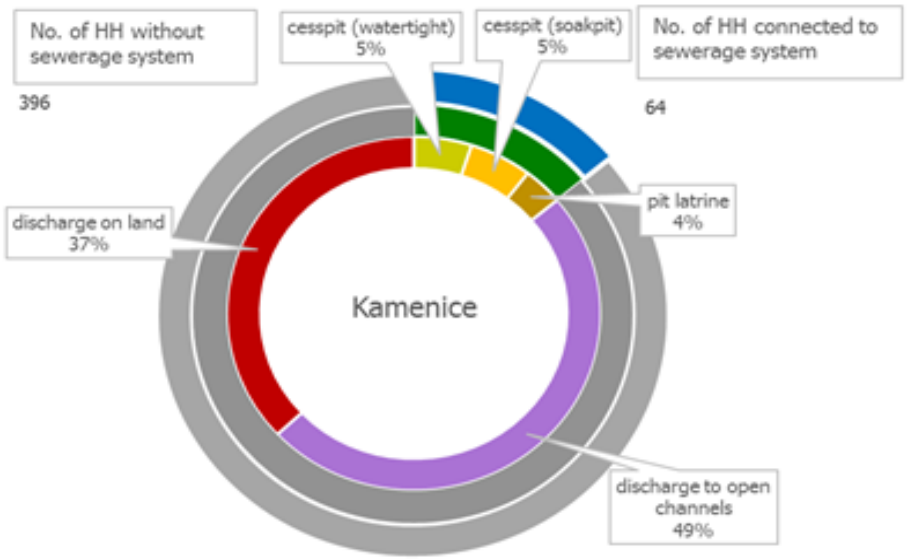


Figure 5. Methods of Wastewater Disposal in Kamenicë.

Retrieved from Posch & Partners Consulting Engineers et al. (2017).

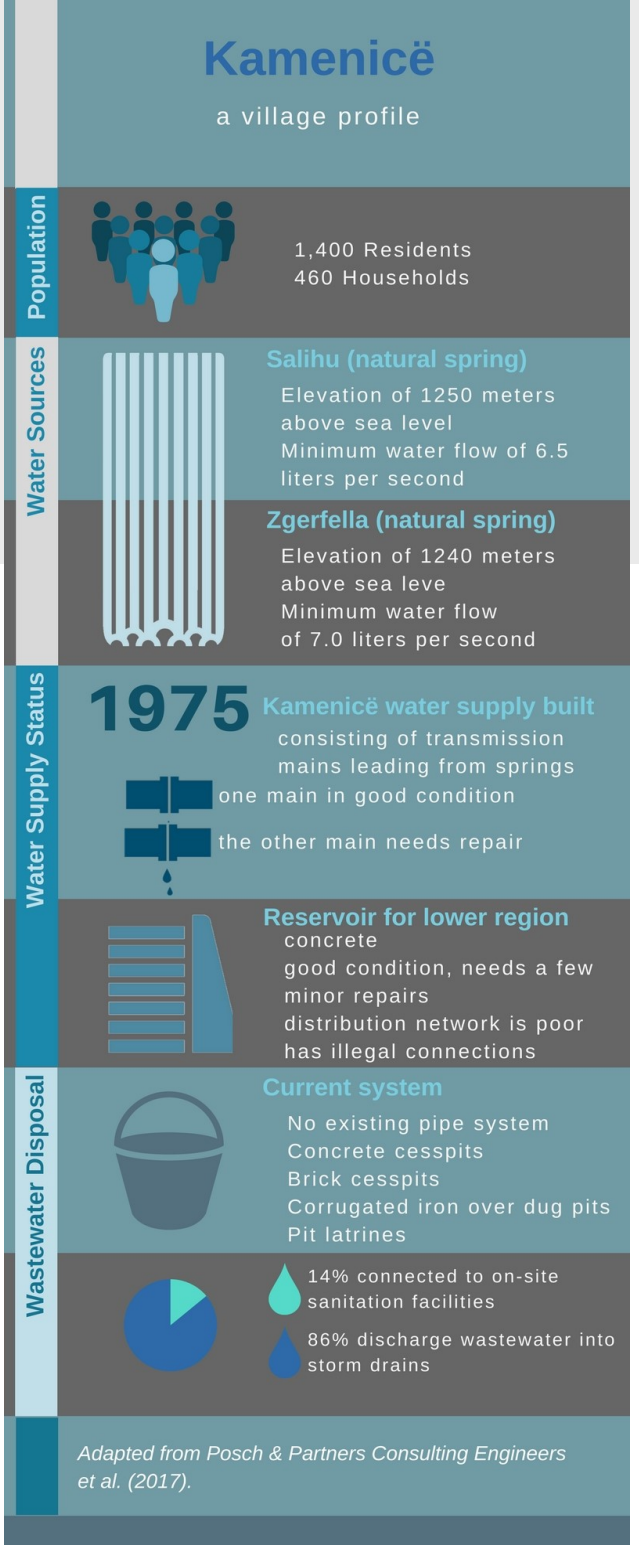


Figure 4: Kamenicë Village Profile

2. Wastewater and its Impacts on Public and Environmental Health

2.1 The Origins and Contents of Wastewater

Wastewater can be produced from homes, farms, businesses, factories, public institutions, and other sources. The origins of wastewater often indicates its composition to some extent. The effect of the wastewater pollution and the type of treatment necessary are both affected by the composition of the effluent (Eymontt & Wierzbicki, 2014). Two common types of wastewater are domestic and agricultural wastewater (Seres et al., 2017).

Domestic wastewater (wastewater produced within residential areas, including blackwater from toilets and greywater from kitchens, bathing facilities, etc.) contains oxygen-demanding wastes, pathogenic microorganisms, organic materials, inorganic chemicals, nutrients that stimulate plant growth, minerals and sediments, as well as sometimes toxic compounds (Sonune & Ghate, 2004). The concentration of these pollutants varies between households depending on household activities and their frequency of occurrence. For example, dishwater contains a higher concentration of biodegradable organic matter than wastewater from toilets, but toilet water contains eight times more nitrogen than dishwater (Eymontt & Wierzbicki, 2014).

Agricultural wastewater has a high concentration of oxygen-demanding organic compound pollutants containing nitrogen and phosphorus (Dordio & Carvalho, 2013). A substantial amount of these oxygen-demanding organic compounds contain nitrogen and phosphorous. The presence of nitrogen is largely attributed to the compound ammonium, which at high concentrations can be harmful to plants. Treatment systems that utilize plants can therefore be ineffective when dealing with agricultural wastewater (Seres et al., 2017). Agricultural wastewater also contains organic xenobiotic substances like pesticides and pharmaceuticals. Pesticides are an important pollutant to be aware of, as they are especially toxic to the environment and ecosystem (Dordio & Carvalho, 2013).

2.2 Wastewater and Human Health

Untreated wastewater may contain pathogenic microorganisms, such as bacteria, viruses, parasites, fungi, and algae, which can infect the public with water-borne diseases including typhoid, paratyphoid, dysentery, cholera, polio, gastroenteritis, and hepatitis A (Aktar, 2009; NSFC, 1996). In 2014, the World Health Organization (WHO) estimated that worldwide, 842,000 deaths occur each year due to diarrheal dis-

Open Drainage Pipe in Kamenicë.

A stream that runs through Kamenicë.

eases caused by contaminated drinking water and improper sanitation and hygiene; nearly 50% of these deaths occur in children under the age of five (WHO, n.d.). Those most at risk for contracting water-borne illnesses are generally children, the elderly, and the poor (NSFC, 1996).

Inorganic compounds found in wastewater also pose a threat to public health. For example, high amounts of nitrogen in water can cause methemoglobinemia, or “blue baby syndrome” which interferes with the ability of blood to receive oxygen. Moreover, heavy metals such as cadmium, copper, lead, nickel, and zinc pose certain health risks when received in large doses (NSFC, 1996).

Contact with wastewater pollutants can occur in areas that lack appropriate wastewater treatment systems. Activities such as walking in a field fertilized with untreated wastewater, touching improperly disposed raw sewage, and swimming in a contaminated pond can all result in direct contact with the pollutants. Illnesses can also occur from consuming produce that is irrigated or fertilized with untreated wastewater (NSFC, 1996). In fact, the primary health risk associated with toxic chemical compounds in wastewater is its contamination of crops and groundwater which are later consumed by humans (Aktar, 2009). Other indirect ways of ingesting wastewater pollutants include consuming meat or milk from animals that graze on contaminated fields or drank contaminated water; consuming fish or shellfish from contaminated water; and consuming foods exposed to insects, like flies, that have fed on sewage (NSFC, 1996).

2.3 Wastewater and the Ecosystem

One of the primary environmental concerns associated with wastewater is the depletion of oxygen from natural bodies of water (Aktar, 2009). Wastewater contains organic substances, which are composed of elements like carbon, hydrogen, oxygen, and nitrogen. When untreated wastewater containing excessive quantities of biodegradable material is discharged into a body of water, especially one that is small and confined, the overall oxygen supply in the body of water can be significantly reduced, killing aquatic life (Aktar, 2009; NSFC, 1997). The specific amount of oxygen needed is known as the biochemical oxygen demand, or BOD, which is a common measurement of wastewater contamination levels (NSFC, 1997). When wastewater rich in nitrogen and phosphorous is discharged into natural bodies of water, eutrophication can occur, which stimulates plant and algae growth, depleting the water of the oxygen supply that aquatic life needs to survive. Furthermore, excessive amounts of oils and greases can also reduce oxygen levels in ponds and lakes by blocking oxygen in the air from entering the water (NSFC, 1997).

Another area of concern is the effects of synthetic organic substances, such as pesticides and herbicides. When disposed of into natural bodies of water, these highly toxic chemicals can poison fish and plants. Contaminated aquatic life can become unsafe for human consumption (NSFC, 1997).

3. Wastewater Treatment

3.1 Centralized Vs. Decentralized Treatment

A rural environment tends to be best supported by a decentralized wastewater treatment system, as the dispersed nature of rural populations makes it difficult to create any network of water transportation necessary for centralized treatment (Abbasi, 2016; Massoud, 2009). Generally, decentralized systems are categorized into onsite systems and cluster systems. In an onsite system, the collection, treatment, and discharge or reclaim of wastewater occurs at individual properties (homes, factories, schools, etc.) and are not part of a larger network. In a cluster system, two or more properties, but not the entire community, share a small treatment unit; individual septic tanks or aerobic units generally provide some level of pretreatment before the wastewater is discharged into the larger system. Oftentimes, onsite and cluster systems are combined (NSFC, 2000).

Centralized systems require fewer personnel to operate and are generally more efficient (Brill & Nakamura, 1977). However, centralized systems have poor long-term flexibility; future advancements in technology, changes in governmental policies, and growth in populations may require costly modifications to the system. Centralized plants can also face public opposition, particularly in agricultural areas, because they require large plots of flat land that might otherwise be used for farming (Brill & Nakamura, 1977).

3.2 Wastewater Treatment Overview

The composition of wastewater determines the necessary intensity of the treatment *(Table 1)*. The first stage of treatment that wastewater must go through is preliminary treatment, during which large, solid materials are removed from untreated wastewater or are reduced in size. These materials include wood, cloth, paper, plastic, garbage, and fecal matter, as well as heavy, inorganic solids, such as sand, gravel, metal, and glass. Preliminary treatment also removes large clumps of oils and greases. Further treatment stages are divided into three major categories based on their intensity; these are primary, secondary, and advanced treatments. In many cases, a combination of multiple treatments is necessary for the adequate removal of pollutants *(Sonune & Ghate, 2004)*.

Table 1: Description of Water Treatment Type.

Type of Treatment	Description
Primary Treatment	• Sedimentation process • Organic and inorganic solids settle and are removed • Reduces total BOD by 25 - 50% • Reduces total SS by 50-70% • Reduces oil and grease content by 55 - 66% • Some organic nitrogen, phosphorus and heavy metals are removed • Effluent may be acceptable quality for irrigation of trees, orchards, and some crops
Secondary Treatment	• Occurs after primary treatment • Removes the remaining organic matter and SS • Uses biological processes (i.e., metabolism by aerobic micro - organisms, mainly bacteria) • Required when risk of public exposure to wastewater is high (i.e., food and crops) • Is also required in most industrialized countries to prevent pollution. • Much of the N and P remain
Tertiary Treatment	• More sophisticated and costly process • Removes N, P, additional SS, heavy metals, and dissolved solids • Required when risk of public exposure is extremely high (i.e., irrigation in public parks) • Carried out to minimalize risk of disease
Disinfection	• Used to kill viruses and other pathogens which may remain in the water • Consist of the addition of a chemical (usually chlorine) to the water

Adapted from Braatz et al. (2017).

The stream that runs through Kamenicë.

4. Wastewater Treatment and the Community

4.1 Social Considerations of Wastewater Services

Neglecting the social considerations of wastewater services "prolongs global environmental problems as well as unjust public health and social conditions" (Saad et al., 2017). While little emphasis is usually placed on social considerations during the development of wastewater treatment systems, past cases have demonstrated that community perception is integral to the success of a system. For example, in 2006, after several years of severe drought, local officials in Toowoomba, Australia, proposed a wastewater treatment and rec ycling project that would have saved Toowoomba nearly $100 million; however, the project was abandoned when residents voted against its implement ation, fearing that recycled wastewater may not be safe for use. Public perception, which is a product of local culture, religion, e conomy, climate, water availability, etc., can sometimes have a greater influence on the success of a wastewater treatment project than any co ncrete scientific or

A Kamenicë Resident Using Water Outdoors to do Laundry

An Outdoor Sink in Kamenicë

economic arguments. Some of the key questions to address are (Saad et al., 2017):

- What judgement strategies shape public decisions to support or reject wastewater treatment plans?
- What factors influence public risk perceptions?
- How does the public's level of trust in local government authorities influence their perception of treatment plans?
- How does the public's level of technical knowledge influence their perception of treatment plans?
- How do public health, environmental conditions, and the economy influence perception?
- Particularly with wastewater treatment and potential reuse, how sensitive is the public to the feeling of disgust (the "yuck" factor)

Tso et al. (1990) argues that by gauging social perceptions during the design of a wastewater treatment system, engineers can try to accommodate them as much as technical and financial limitations allow. In the future, authorities would also be in a better position to make socially acceptable decisions regarding the system. A sociotechnological approach to wastewater treatment that takes public perception into account benefits system efficacy and efficiency because it increases user compliance; infrastructure is likely to be "more widely used and optimally sustained by all user groups" (Saad et al., 2017). In turn, user compliance to wastewater treatment facilitates the development of a community as a whole by increasing water production and consumption, awareness for environmental security, and public health and welfare (Saad et al., 2017).

A study done in rural Kazakhstan, where (like in rural Albania) there is an effort to connect the population to water services, looked into residents' perceptions on the topic of wastewater. The study found that 34% of the rural population regarded safe water and wastewater treatment as "very important", and 38% viewed it as "important." It was also found that 65% were willing to connect to and pay for water supply and sanitation services. Overall, the implementation of a new system in these areas would have the support of over half of the residents, which is significant because as has been discussed, user compliance is important to the success of treatment systems (Tussupova et al., 2016).

4.2 Socio-Economic Considerations of Wastewater Services

A socioeconomic study conducted in four rural villages in the Former Yugoslavic Republic of Macedonia (FYROM) found that approximately 80% of residents with access to wastewater treatment did not pay disposal fees, a result of a lack of willingness to pay coupled with an ineffective tariff collection system. The study recommends that authorities make an effort to assess the financial capacities and willingness-to-pay of local residents before selecting a particular wastewater treatment solution, as disposal tariffs contribute towards the financial capital necessary for the operation and maintenance of a treatment system. The systems studied in FYROM had the technological ability to meet treatment standards set forth by the European Union, but proper operation and maintenance were impossible due to financial difficulties. A lack of tariff collection forces municipal authorities to seek additional funding from external donors, which brings the self-sufficiency and financial stability of the municipality into question. Furthermore, during the planning of infrastructure development projects, financial difficulties may encourage municipal authorities to invest in the cheapest technologies rather than the best available technologies with better long term performance (Ertl et al., 2010).

The FYROM study recommends that in designing wastewater treatment systems, the participation of local residents should be prioritized "to create the acceptance needed to generate revenues to cover operational costs" (Ertl et al., 2010). Methods for utilities to engage with the public include: (1) conducting customer satisfaction surveys, (2) holding public meetings and presentations, (3) distributing newsletters and educational material, (4) hosting open houses at wastewater treatment facilities, and (5) making public service announcements via local media (Dodson, 2013).

The study is relevant because FYROM's socioeconomic and political characteristics are comparable to those of Albania; for example, the percentage of rural households with access to a sewer system and the ratio of wastewater disposal tariffs to average rural income are similar in the two countries. In rural FYROM, average monthly household income is approximately 200 USD per month with a 3.4% disposal tariff (Ertl et al., 2010). In rural Albania, 31% of households are in the 10,000 - 25,000 lek (approximately 90 - 220 USD) per month income range, and 42% of households are in the 25,000 - 50,000 lek (approximately 220 - 440 USD) per month income range (Hoxha et al., 2012), as shown in *Figure 7. Figures 6, 8,* and *9* display additional demographic and socioeconomic information about rural Albania.

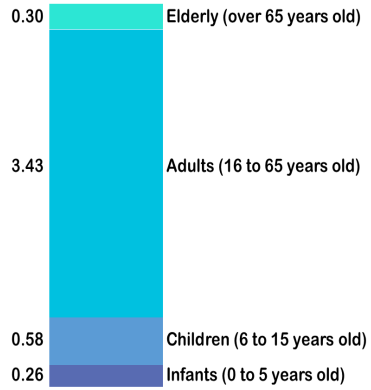


Figure 6: Size of Average Rural Albanian Household by Age Group
Adapted from Hoxha et al. (2012).

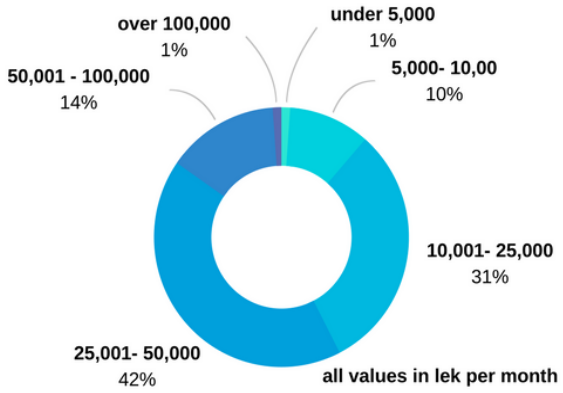


Figure 7: Average Rural Albanian Family Income Range
Adapted from Hoxha et al. (2012).

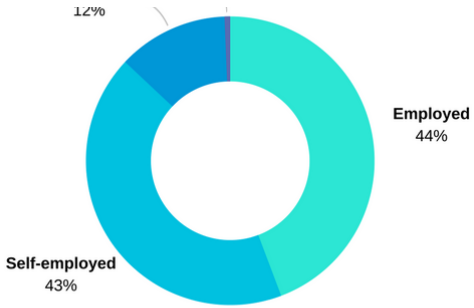


Figure 8: Main Source of Average Rural Albanian Family Income
Adapted from Hoxha et al. (2012).

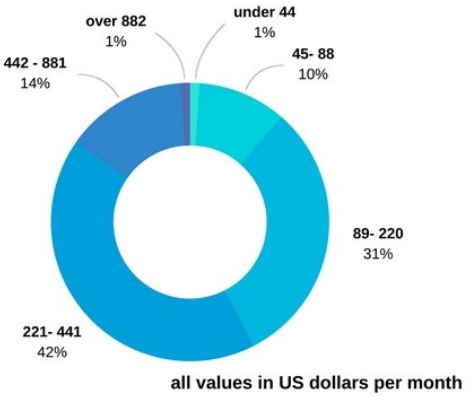


Figure 9: Average Rural Albanian Family Income Range (USD)
Adapted from Hoxha et al. (2012).

Table 2. Characteristics of Albanian Emigrant Population, 1996

	Total Population	Emigrants	Either currently an Emigrant or Would like to Emigrate
Age			
0 -14 years	20.90	0.26	8.36
15 - 24 years	23.61	35.48	34.16
25 - 39 years	20.90	49.36	38.52
40 - 54 years	21.70	14.14	17.08
Over 54 years	12.90	0.77	1.87
Gender (among pop. 15-54)			
Male	48.50	81.04	72.45
Female	51.50	18.96	27.55
Highest level of Education (among pop. 15 +)			
Primary School (8 years)	38.55	28.37	28.44
Secondary School (12 years)	45.07	58.77	55.73
University	16.38	12.89	15.83
Marital Status (among pop. 19 +)			
Married male	34.10	29.41	35.04
Married female	37.44	15.78	19.04
Single male	15.87	50.80	37.13
Single female	12.59	4.01	8.78
Urban	46.75	40.36	44.48
Rural	53.25	59.64	55.52

Adapted from Konica & Filer (2009)

Table 3. Relationships Between Household Characteristics and Emigration, 2009

	% of Total Family	% of families with Emigrants
Urban	49.07	40.57
Rural	50.93	59.43
Family Size		
1-2 persons	3.70	1.42
3-4 persons	44.69	32.74
4-6 persons	40.12	48.04
Over 6 persons	11.21	17.79
Family Income		
1– the lowest	32.72	45.20
2	27.78	30.25
3	21.30	13.17
4	7.72	5.69
5	3.91	2.85
6– the highest	6.58	2.85

Adapted from Konica & Filer (2009)

4.3 Rural Albanian Culture and Society

A 2014 ethnographic study conducted in Gjonomadh, a village located 11 kilometers outside of urban Korçë, found that prior to the fall of the Albanian communist regime in the early 1990s, the state enforced collectivity in the usage and management of land resources. After the rise of capitalism, properties were distributed back to their original owners; personal wealth now determines each villager's ability to use and manage the land and its resources, and individuality and self-sufficiency became emphasized (Kokalari et al., 2016).

The Gjonomadh study also found that there is an increasing drive within the community to preserve the environment. During the communist regime, hills surrounding the village were heavily deforested and terraced, but a local resident stated in a 2014 interview that there was an ongoing three-year effort to gather signatures to permanently protect the hills. The resident argued that the regrowth of the forests would prevent flood, provide fresh air, and offer aesthetic appeal (Kokalari et al., 2016).

Another effect of the governmental change in Albania was the massive increase in emigration that occurred as a result of the opening of the country's borders. It is estimated that by 1996, between 300,000 and 400,000 Albanians (approximately 10% of the total population) had left the country, either legally or illegally, with around 75% settling in Greece. Each year, many emigrants also returned to Albania, either voluntarily or after being captured by authorities. In 1995, for example, there were an estimated 116,000 returned emigrants (Konica & Filer, 2009). *Table 2* outlines the demographic characteristics of the Albanian emigrant population in year 1996. Note that nearly half of emigrants were between the ages of 25 and 39, and nearly 60% came from rural areas. As shown in *Table 3*, emigrants often came from relatively large, rural, low-income households.

In rural Albania, it is common for the youngest son to inherit the familial home and to assume responsibility for the care of their aging parents while the other children either migrate out of the country or move to their own home. According to a 2002 Albanian cultural profile, a large amount of respect is shown towards the elder population. In rural villages, a "council of old people" often act as the highest authority, with the oldest man at its head. In recent years, there has been a shift towards societal modernization. This modernization includes a marked increase in the social status of women. The cultural profile states that "from a juridical point of view, Albanian women have reached a degree of emancipation comparable to that of any western women." However, the profile concludes that especially in rural areas, "Albanian women still live according to a 'traditional' model," tending towards a patriarchal family structure (De Lucia et al., 2002).

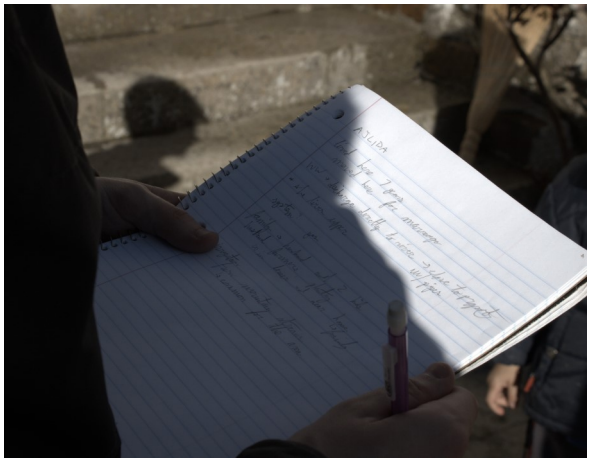
5. Economics and Program Management

5.1 Financial Feasibility

Factors that must be taken into account when determining the cost of a system include total capital cost, annual operation and maintenance cost, total annual cost, and the average monthly cost per household. Furthermore, system costs are dependent upon the population size and density, the local topography, the distance to the nearest treatment facility, and the performance standards required (NSFC, 2000).

5.2 Tariffs and Operation and Maintenance

The European Water Framework Directive requires all wastewater treatment plants in European Union nations to be financially capable of covering all managerial and operational costs in terms of replacing broken equipment and dealing with population increase and coverage expansion (Ertl et al., 2010). Keeping tariffs too low interferes with a utility's ability to maintain and upgrade systems. This leads to a cycle in which service degradation due to lack of funding lowers the customer's willingness to pay, which further decreases funding and degrades service. Low tariffs also make it difficult for a company to expand its coverage to poorer communities, prompting, for example, illegal connections to water supplies by those who are not receiving service (Manjani et al., 2011).



Approach

In order to assess the current state of wastewater treatment and its development in Kamenicë and to understand the associated social perceptions, we conducted a case study on the community; we analyzed the experiences of residents in a village without organized wastewater treatment during a period of community development. Our research process involved: (1) interviews with water sector experts; (2) interviews with community members; (3) participatory mapping activities with UKKO employees; (4) photo documentation of the village; and (5) archival research on infrastructure development plans (*Figure 10*). These methods allowed us to answer the following research questions, which emerged both before and during our fieldwork:

1. How do Kamenicë residents describe their experiences living in a village without organized wastewater treatment during a period of community development?
2. In what ways is the community developing?
3. How does UKKO plan to develop organized wastewater treatment for the village?
4. How do the experiences of residents influence their perceptions on future wastewater treatment development?
5. How do these perceptions influence their opinions on future wastewater treatment development?

This chapter discusses each of our research methods in more detail. Each method used was selected for its ability to address our research questions. We outline how each method was executed and how it contributes towards the case study as a whole.

In this Section:

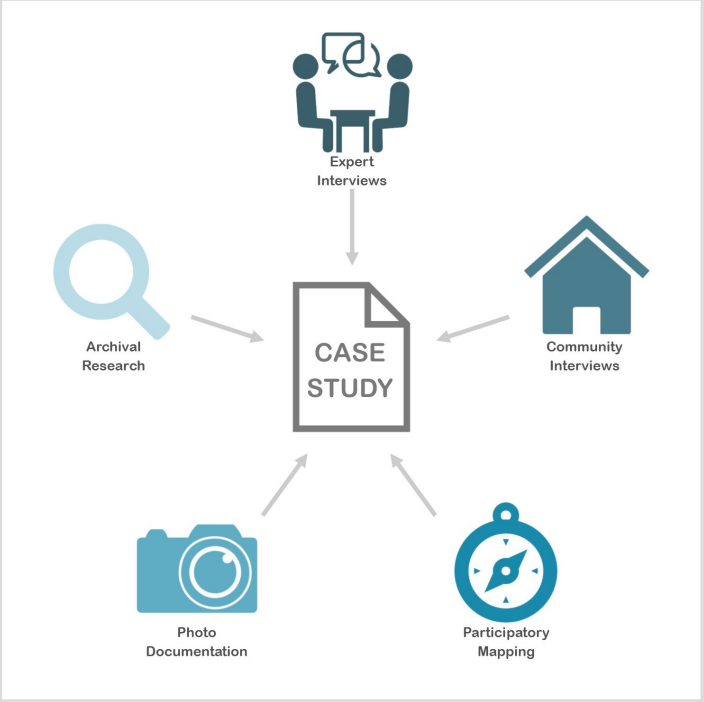


Figure 10: Methods to Develop Case Study

1. Case Studies

As a method for qualitative research, case studies involve the collection and presentation of detailed descriptive data about an individual or group of individuals in order to answer “how” and “why” questions (Baxter & Jack, 2008; Colorado State University [CSU], n.d.). According to Baxter and Jack (2008), a case study method should be considered when it is necessary to establish the contextual conditions which are relevant to the studied phenomenon. The end goal is not to form universal generalizations from the data but rather to draw conclusions that are specific to the research subjects and the context of the study (CSU, n.d.). Case studies are designed to support future research by “[providing] the basis for the application of ideas and extension of methods” (Soy, 2006).

Picture from our interview with the mayor.

Retrieved from Bashkia Korçë Facebook page

2. Expert Interviews

The first strategy we employed to understand the development of water services in Kamenicë and UKKO's role in said development was expert interviews. These interviews were conducted with UKKO employees, the mayor of the Municipality of Korçë, and the executive director of the Water Supply and Sewage Association of Albania (SHUKALB). The interviews were conducted in English and were semi-structured with a list of broad themes we used to aid our discussion, allowing our team to deviate from the script and pursue points of interest that arose throughout the course of the interview. We used purposive sampling for our UKKO interviews, seeking out the head of the public relations department, the Commercial Director in the finance department, a chemist, and a hydraulics engineer.

We interviewed the head of public relations, the chemist, and the hydraulics engineer in order to understand UKKO's plan for wastewater treatment in Kamenicë in a technical and social sense. After securing the interviewee's consent, we asked questions associated with the theme of UKKO's proposed plan and other questions that emerged during the interview. We recorded the interview for future reference, and took notes of what was said. The notes were used to develop our understanding of UKKO's plan. A sample of our interview script can be found in *Appendix A*.

To answer our questions about how UKKO structures its tariffs for its clients, we conducted an interview with the Commercial Director who works in the finance department and oversees the tariffs imposed on Korçë residents. We created a list of questions that asked for approximate costs for different systems, construction, and management as well as how UKKO decides on tariff levels. Because of the specificity of these questions, we sent the questions to the interviewee in advance so she could prepare accurate answers. Again, we received consent to record the interview and took notes that we later referenced. A sample of this interview can be found in *Appendix B.*

Our final expert interview was with the mayor of the Municipality of Korçë. This interview was conducted so we could gain insight into the development of rural villages and UKKO's role in that development from the perspective of the government. This interview was structured to be more formal and scripted than previous expert interviews, but still allowed for deviation from the script. We prepared a list of questions that asked about the recent municipal changes in the region and what the mayor thought about Kamenicë's situation in regards to wastewater. Consent was given by the mayor, and the interview was recorded. The notes taken during the interview and the recording were used to form our broad understanding of the region and its communities. A sample of the interview script is in *Appendix C.*

2.1 Archival Research

In all of our interviews with UKKO employees, we requested any technical or financial documents pertaining to the company's proposed plans for developing wastewater treatment infrastructure in Kamenicë. The purpose was to further establish the context of our case study and to be able to evaluate the feasibility of UKKO's plans from a social perspective at the conclusion of our research. We used this archival research to supplement the information that we obtained from our interviews with experts from UKKO.

3. Community Interviews

Interviews with local residents were conducted in a semi-structured format. Using semi-structured interviews allowed us to:

- Understand the motivations behind people's choices and actions;
- Explore people's attitudes and beliefs;
- Identify the personal impacts of specific policies or events;
- Reveal information not anticipated by the interviewer (Raworth et al., 2012).

In our semi-structured interviews with community members, we used open-ended questions, actively followed-up on responses, and probed for details. We were guided by themes such as:

- The current state of wastewater and wastewater treatment in the village;
- The community's perceptions of present circumstances;
- The community's level of awareness with regard to the dangers of wastewater and the perceived necessity for wastewater treatment;
- The community's attitudes towards future development projects;
- The history, demographics, customs, and way of life in Kamenicë.

These interviews took place on front porches, inside homes, and in various public and private spaces in Kamenice and were often completed in a group setting. The interviews were all conducted in Alba-

nian, with questions and responses interpreted by an employee of UKKO. Team members took notes during each interview, and if the setting allowed, interviews were recorded. Sample questions from our interviews with Kamenicë residents can be found in *Appendix D*.

3.1 Sampling

During the early phases of our fieldwork, we used convenience sampling to identify village residents to interview. With the assistance of Albanian-speaking UKKO employees familiar with Kamenicë, we approached households at random to ask to interview.

In our early fieldwork, it became apparent that both Kamenicë residents and UKKO employees alluded to three distinct geographic

and socioeconomic sections of Kamenicë: "Lower", "Center", and "Old." Because of these distinctions, our interview samples were then selected using a hybrid method that incorporated both stratified sampling and convenience sampling. Specifically, the village population was divided into geographical strata, and convenience samples were taken from each stratum. We believe the division of the population into these strata allowed for greater socio-economic heterogeneity in our interview subjects. Because convenience sampling was still used within each stratum, it was difficult to control the number of samples taken from each stratum. At the conclusion of our study, three households were interviewed from Lower Kamenicë, seven from Center Kamenicë, and three from Old Kamenicë .

Semi-structured interviews were also held with the director of the primary school in Kamenicë and the nurse at the community clinic. Our team decided that it was important to understand the point of view of the primary school director because the education program for the children in the community helps shape the ideas and opinions of future Kamenicë generations. We interviewed the community nurse to hear her perspective regarding wastewater and its relation to human health. The questions and themes covered in these interviews are outlined in *Appendix D*.

3.2 Analysis

Team members recorded notes during each interview. A structured summary document (the template of which can be found in *Appendix E)* was prepared for each interview. Handwritten notes were organized and transferred to the electronic document. If available, audio recordings were reviewed and used to supplement and/or to confirm the accuracy of our handwritten notes. Significant visual observations from the interview were then recorded on the document alongside any further questions that emerged from the conversation (if possible, we conducted follow-up interviews with participants to address these new questions). Finally, each member of the project team examined the notes from each interview and identified key takeaways; these takeaways were written as concise theme statements.

Interview data was analyzed qualitatively using a thematic analysis method adapted from Löfgren (2013). To begin, each completed interview summary document was examined in depth. Words and phrases from each section of the document were coded according to whether they:

- Were repeated in the same document or across multiple documents;
- Were unique or surprising;
- Were emphasized, whether explicitly or implicitly, by the interviewee;
- Addressed one of the predetermined questions or themes of the interview;
- Reflected or challenged our background research or other field research;
- Revealed something interesting about the community that is not necessarily related to wastewater (e.g., its history)

Multiple codes relevant to each other were grouped together to form categories. In thematic analysis procedures, categories are sometimes known as themes (Löfgren, 2013); however, to avoid confusion with the themes covered in our interviews and the themes listed in our interview summary documents, we refer to them as categories. Categories were labeled using short but descriptive names.

4. Participatory Mapping

The emerging idea of the three distinct zones of the village prompted us to utilize two participatory mapping activities to supplement our onsite observations and to gain a stronger understanding of the plans that UKKO is considering for the village.

One of the participatory mapping activities was conducted with two UKKO employees who work directly in the village as water meter readers. The goal of this activity was to "help create a socially or culturally distinct understanding of landscape and [to] include information that is excluded from mainstream or official maps" (Rainforest Foundation UK, n.d.). With this understanding, we could better address one of our research questions which aimed to gain insight into how the community is developing. The activity also served as a guide when it came to selecting interviewees from the village. Considering the various regions of the village allowed us to create a diverse sampling pool within our interviews. In the activity, we provided participants with zoomed out maps of the whole village and asked them to identify and label regions within the village, as well as to trace and label significant waterways or locations where wastewater streams are mixed with natural water streams.

From previous interviews, we had gained information on the technical plan being considered, but we lacked information on the geographical aspects of the plan. In hopes of gaining more insight into this facet of the plan, we used a second participatory mapping activity. We carried out this activity with a hydraulics engineer from UKKO who has spent time working on the project in Kamenicë. We provided the employee with the same map from the aforementioned exercise, but this time, we asked the employee to mark the areas where UKKO is considering placing septic tanks and label how many they planned to place. This exercise was designed to enrich our answer for our research question addressing UKKO's plan. A blank copy of the map that we provided can be found in *Appendix F.*

UKKO Employees Doing the Mapping Activity

5. Photo Documentation

To keep an authentic record of our observations, we took photographs throughout our fieldwork in Kamenicë. These photographs depicted site features including:

- Landscape
- Residential and public buildings
- Agricultural areas
- Roads
- Water drainage systems
- Channels, streams, and other waterways

These photographs aided us in establishing the physical setting of our case study. They also captured infrastructural characteristics of various parts of the village, thus providing insight into how the community has developed over time.


HI-TEC
HI-TEC

Case Study

In this Section:

1. Overview of Village Geography

Located at the edge of the Korçë basin, Kamenicë sits between thousands of hectares of fields in the north and towering mountain ranges in the south. The transition between these topographies occurs within Kamenicë: the northern portion of the village consists of flat agricultural land (*Figure 11),* but proceeding south, the terrain gradually becomes hillier and more complex *(Figure 12).* Elevation ranges from approximately 900 meters above sea level to just over 1000 meters above sea level.

Participatory mapping activities, supplemented by our own observations, revealed Kamenicë's multiple, distinct geographic regions and two major waterways, illustrated in *Figure 13.* Through their work as the community's water meter readers, UKKO employees Artur Kodra and Sotiraq Dhomonika are very familiar with Kamenicë's geography. They completed two participatory maps.

Figure 11: Image of Village Field

Figure 12: Image of Village Hills

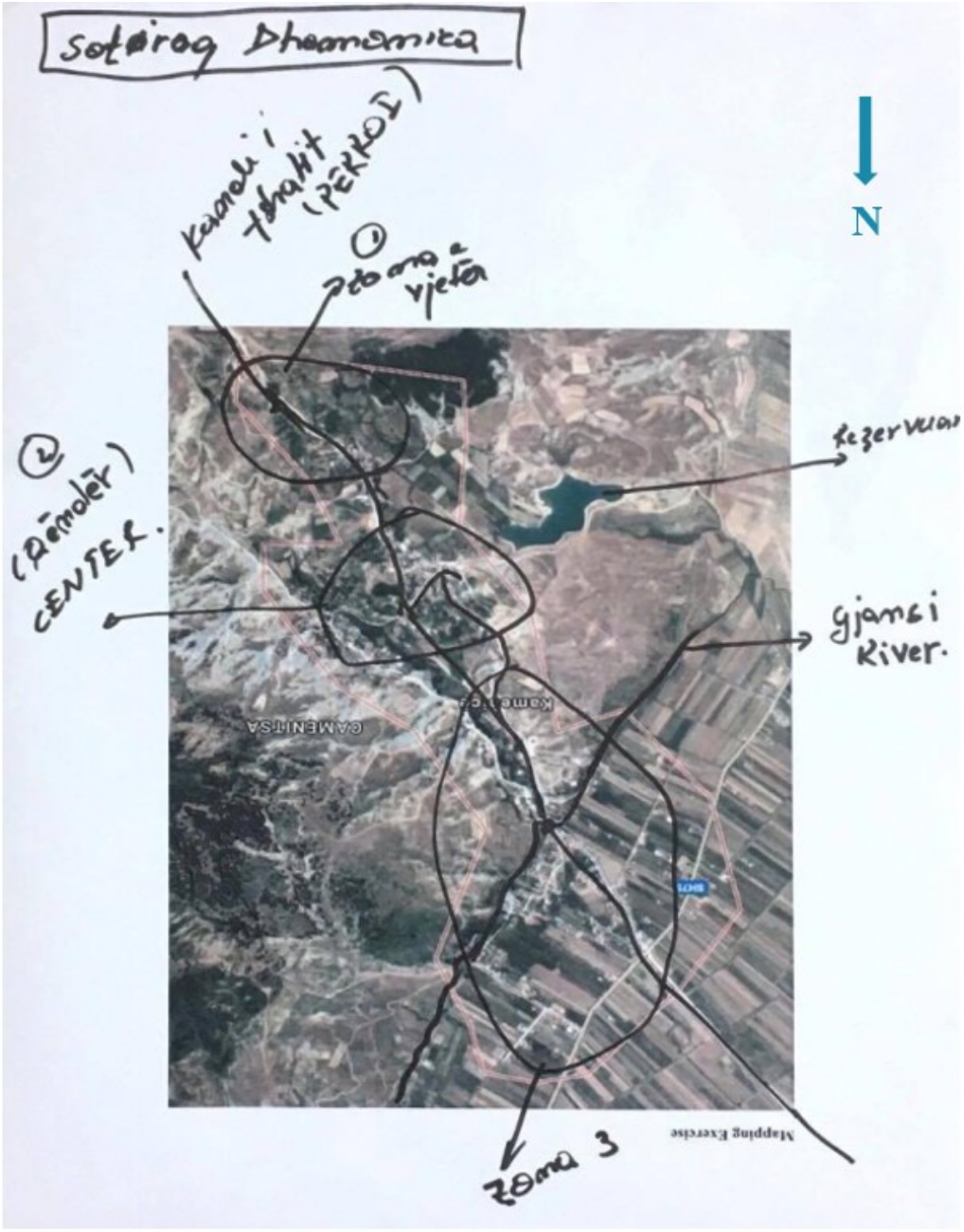


Figure 13. Participatory Maps Completed by Artur Kodra and Sotiraq Dhomonika. Geographic regions of the village are circled, and major waterways are traced with a line or otherwise labeled. Note that north is directed downward.

Both Artur Kodra and Sotiraq Dhomonika identified three geographic regions in Kamenicë. The "zona e vjetër," or "old zone," is located in the southern portion of the village. To the north is "zona 3", or "zone 3." The village "center," or "qender" in Albanian, lies between the old zone and zone 3. The terminology that we use to refer to these regions are: **Old Kamenicë** for old zone; **Lower Kamenicë** for zone 3; and **Center Kamenicë** for center.

With regard to major waterways, both participants identified the "kanali i fshatit," or "village stream," which runs from the southeast to the northwest and passes through all regions of Kamenicë. They also labeled the Gjanç, a river that flows through Lower Kamenicë from the southwest to the northeast. We refer to these waterways as the **stream** and the **river**, respectively.

Although Artur Kodra and Sotiraq Dhomonika identified Old Kamenicë as only the small region south of Center Kamenicë, our field observations suggested that another region of the village can also be categorized as part of Old Kamenicë, as shown in *Figure 14*.

This additional part of Old Kamenicë, which we refer to as Old Kamenicë Adjunct, is on the northeast side of the village stream. The area is geographically closest to Center Kamenicë, but we categorized it as Old Kamenicë. Unlike other regions of the village, both this region and Old Kamenicë have many abandoned homes, no paved roads, and other underdeveloped infrastructure.

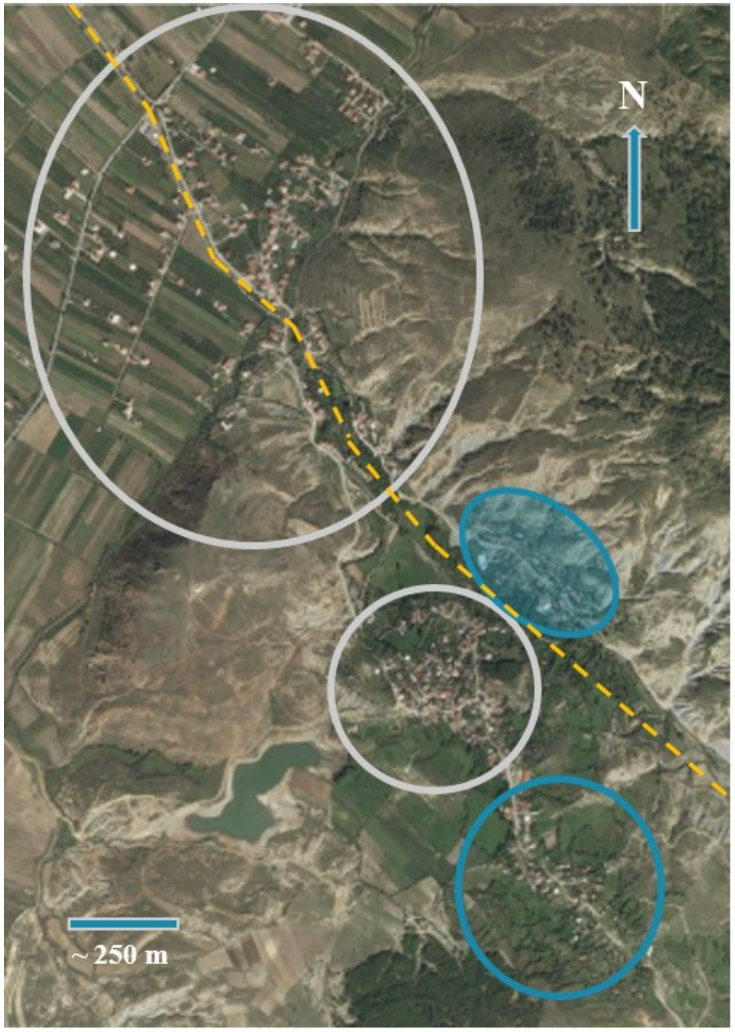
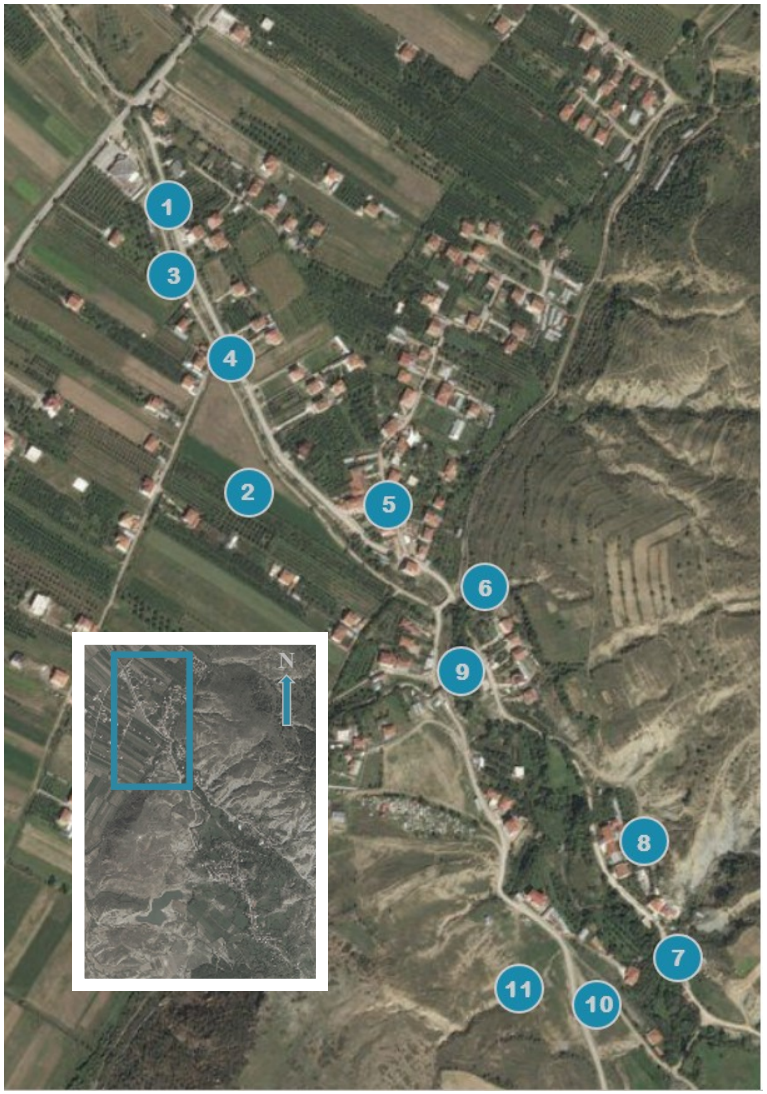


Figure 14. Observed regions of Kamenicë. Lower and Center Kamenicë are circled in gray, and Old Kamenicë in blue. The additional part of Old Kamenicë that we identified is circled and shaded in blue. The dashed, yellow line represents the approximate location of the village stream.

1.1 Photo Tour

The visual observations that we made during our time in Kamenicë simply cannot be described in words. Instead, we hope to effectively communicate our experiences through photographs. The following series of photo tours is designed to detail the physical characteristics of each region of Kamenicë by illustrating the terrain, the layout of buildings and roads, and the state of infrastructure, amongst other features. It aims to paint a better picture of the setting of our case study.

Lower Kamenicë



1

Several larger, newer homes are scattered along one side of the only road to Kamenicë.

Kamenicë's vast agricultural fields can be found on the other side of the road. Here, farmers grow apples and cherries.

2

3

The shallow village stream runs alongside the road. Its flow is relatively strong, and some garbage can be found in the water.

A few hundred meters down the road, village buildings and the church begin to appear in the distance. Morava Mountains in the background are snowcapped in the winter. 4

An unpaved side road extends from the main road. It leads to the more densely packed residential neighborhood of Lower Kamenicë consisting of approximately 25 households. 5

6 Continuing on the main road, one soon reaches a fork. From this point, Kamenicë is split in half by the village stream. Old Kamenicë Adjunct is to the left along the northeast side of the stream; Center and Old Kamenicë are to the right across the stream.

Lower Kamenicë continues for another few hundred meters on both sides of the fork. The left side is newly paved and is the only stretch of road in the village with a sidewalk 7

8 There are several houses on the left side of the fork. The large house pictured is not fully built; only the first floor is inhabited. Note that the area and its properties appear new and well maintained

The concrete aqueduct near the fork carries the Gjanç River over the village stream, which is not visible in the photo but runs perpendicular to the aqueduct. These waterways do not mix. 9

On the right side of the fork, the road runs up a small hill, passing the mosque and Kamenicë's school (pictured) 10

Across from the school are rolling farm fields. Although the road continues, this area is the boundary of Lower Kamenicë. 11

Beyond the school, the road runs alongside a hill towards Center Kamenicë, approximately half a kilometer away.

1

2

3

4

5

6

There are numerous houses near each other in Center Kamenicë. They vary in age, size, and condition, but most properties are small. Several unpaved side streets extend off the paved main road. Center Kamenicë has a steeper slope than Lower Kamenicë

There are excellent views of Center Kamenicë from the old church at the top the hill. The reservoir in the background provides water to a nearby community, but not Kamenicë .

7

Center Kamenicë

Northwest from Center Kamenicë are the buildings of Lower Kamenicë. The Korçë basin is in the distance.

8

Looking south, one can see the main road of the village heading towards Old Kamenicë.

9

10

The main road continues to a small plateau on the outskirts of Center Kamenicë. The old church is visible in the background.

Old Kamenicë

1

The paved section of the main road ends, marking the boundary between Center and Old Kamenicë. Houses of Old Kamenicë located closer towards Center Kamenicë are in good condition. Most of them are inhabited.

Deeper into Old Kamenicë, the terrain becomes very hilly, and unpaved roads are difficult to walk on. Car travel is not possible.

2

3

4

5

Dozens of homes in Old Kamenicë are abandoned and collapsing.

6

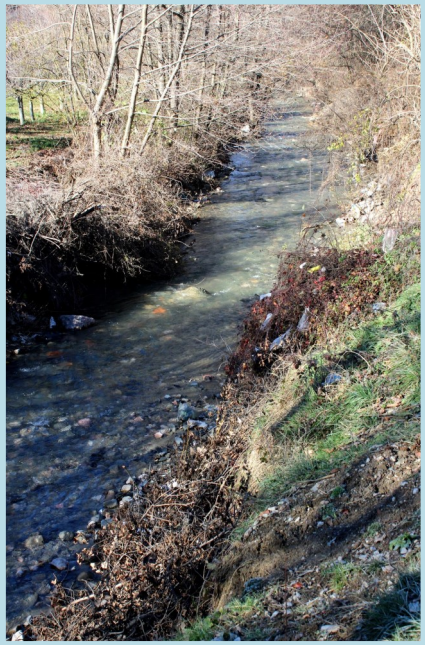
A few homes are still inhabited. 10

9 Some buildings in the area have entirely collapsed.

Larger buildings have been neglected and abandoned over the years.

A few hundred meters from the fork in Lower Kamenicë is another old section of the village. Similar to the boundary between Center and Old Kamenicë, the pavement abruptly ends. This marks the beginning of Old Kamenicë Adjunct.

1



2

The village stream run alongside the road to Old Kamenicë Adjunct.

3

The main road in Old Kamenicë Adjunct is also unpaved. The area is relatively flat.

Two or three narrow, unpaved side streets run perpendicular to the main road.

4

5

Roads become extremely muddy in wet weather. Deep puddles make them difficult to walk on. In these conditions, travel by car is impossible .

Old Kamenicë Adjunct

Similar to Old Kamenicë, many properties in the area have been abandoned, and buildings are starting to deteriorate.

Some properties are inhabited and well taken care of. They are often surrounded by abandoned homes.

The main road, as well as Old Kamenicë Adjunct, ends at a footbridge across the village stream. A dirt path on the other side leads up a steep hill towards Center Kamenicë.

2. Village Demographics

Kamenicë's 1,400 residents live among approximately 460 households. Some households that we visited consist of a married couple and one or two school aged children; other married couples lived alone since their adult children had moved out. The house size and properties in Kamenicë vary by region. In Lower Kamenicë, homes tend to be newer, larger, and more spread out. From our observations and interviews, we noted that Lower Kamenicë is largely populated by younger, newer families who have children. Center Kamenicë is densely populated with a mix of old and newly constructed houses. Old Kamenicë contains the oldest homes, many of which have been abandoned. Of the approximately 120 houses in Old Kamenicë, only 20 remain inhabited based on the accounts of several interviewees. The empty homes were abandoned due in part to the mass internal migration to Lower Kamenicë, as well as emigration out of the village, the region, and the country that occurred beginning in the 1990s.

Extended families live in close proximity to each other. On several occasions, interviewees would point down the street to indicate where their relatives lived. One respondent said there are 22 households who share his family name in the village. Family structure is highly patriarchal: family units settle or remain in the village based on the men of the household's familial history. Of the 12 married individuals or couples we interviewed, all confirmed that the husband has lived in the village (sometimes even in the same house) his entire life, and the wife moved to her husband's home upon marriage, whether from outside or within the village. Additionally, parents reported that their daughters left Kamenicë to live with their husband in another village.

While in Kamenicë, we interacted primarily with middle-aged to elderly individuals and couples aged approximately 40 years old or above. And according to the director of the school, there are 148 students aged between five and 14 years old attending school in the village. One interviewee recounted that upon completing high school, young people often leave the village to pursue work elsewhere, typically in Greece. Other interviewees stated that their children departed for Tirana, Italy, and even the United States.

The residents we interviewed reported that their income gen-

erally comes from three main sources: employment, pension, and remittances from children. Residents in four of the households were retired and received government pensions. Five interviewees said they receive remittances from their children. Nine of the households had at least one adult locally employed in jobs such as agriculture, day labor, or, in one case, a private business (a market that sells food and other dry goods). The majority of the village's economy is agricultural. Lower Kamenicë consists of large, fertile fields, and many of the properties in this region also include areas for raising livestock. Residents grow apples and cherries, produce cow milk, and make other agricultural products. Farmers sell their goods at roadside stands on the main road just outside of Kamenicë. Apples and cherries are sometimes even exported to Italy and Kosovo.

" Three live in the house at the moment, but seven live in the house when our sons and daughters come back from Athens"

- Gani Lika

Figure 15. Wastewater Disposal Method of Interviewees

3. Current Wastewater Situation

Out of the 13 interviewees we spoke with, nine used a septic tank for their wastewater disposal. Each of these nine individuals built their own septic tank or had a role in constructing it. Villagers described the typical septic tank as consisting of a single hand-dug pit lined with concrete, wood, or dirt with gravel at the base. Other households discharge their wastewater directly into the nearby stream. Those who discharge into the stream tend to live very close to the waterway. A summary of systems can be found in *Figure 15*.

Beyond the septic tank, each region of the village manages greywater and stormwater differently. Lower Kamenicë has only the main stream to carry greywater, storm runoff, and raw wastewater of the houses that practice direct discharge. Center Kamenicë has concrete channels that run along the sides of the road to carry stormwater and any discharge from households' septic tanks to the village stream. According to one interviewee, residents of Center Kamenicë rarely discharge their wastewater directly into the village stream because Center Kamenicë is not in close proximity to the stream. In Old Kamenicë and Old Kamenicë Adjunct, the channels on the side of the road are less developed; they are simply hand-dug channels with no concrete structure.

A constructed side channel from Center Kamenicë (Left), Hand dug side channel from Old Kamenice (Center), Pitcure of a resident constructed septic tank *Retrieved Posch & Partners Consulting Engineers et al., (2017)* (Right)

4. Kamenicë Resident Profiles

While in the village of Kamenicë, our team conducted interviews with 13 different households and 21 different individuals. We interviewed elderly retirees and a university student. We traveled from the oldest part of the village containing houses that have been standing for over one hundred years to the lower, newer section spattered with houses that aren't much more than twenty years old. We spoke with men and women who were farmers, homemakers, and merchants. We learned about their lives, longings, and livelihoods. What follows is a brief introduction to the depths of their lives.

1. Nico & Haxhire

Fifty-year-old Nico Hysen lives with his wife, Haxhire, in a large house that they built themselves. It has a big front yard and sits across the street from the village stream in Lower Kamenicë. Nico was born in Kamenicë, and Haxhire has lived in the village since their marriage 40 years ago. The couple have three daughters who are all married and living with their own families in Greece. Splitting their time between Kamenicë and Greece to be closer to their daughters, the Hysens are both retired and receive a government pension. The couple did emigrate when they were younger to work in Greece, where Haxhire worked as a housekeeper and Nico worked in construction.

Nico built the family's septic tank in 1998 to treat their blackwater. The septic tank is a one square meter wide by two meter deep hole lined with concrete blocks. Nico cleans out the sludge from the septic tank once every four years and mixes it with animal manure to dry and use as fertilizer. Both Haxhire and Nico expressed a desire for a unified wastewater treatment system, but neither attributed any health issues in the village to wastewater exposure. While Nico expressed that he did not think the village stream was "as dirty as some people might think," and did not notice any odor coming from the stream, both want their village to be as "developed" and "comfortable" as other European communities. The couple said it may be difficult for themselves and others in the village to pay tariffs for the maintenance of a wastewater treatment system, but they are still willing to accept this cost for the improvement of the village.

2. Andrea & Valter

A native of Kamenicë, 55-year-old farmer Andrea Medi has lived in the lower part of the village for the past 20 years. Before then, he was a resident of Old Kamenicë. Andrea grows apples and cherries on his nearby fields, which are irrigated using water from the Gjanç River and treated with purchased fertilizers and pesticides. Back at home, Andrea also plants fruits and vegetables in his yard for himself and his wife. The couple do not have any children. Aside from crops, Andrea has a cow and a horse, but they are kept far away from his house because he and his wife cannot tolerate their odor.

Unlike many other residents of Kamenicë, Andrea has a shared septic tank that is used by a few households in the neighborhood. It was constructed 17 years ago and, according to Andrea, does not require frequent cleaning. Even though he does not perceive health issues in the village, Andrea is open to change. He and his friend and neighbor, Valter Hyska, asserted that the installation of a network sewage system would be best for the community. They believe that this solution is superior to septic tanks because it avoids the problems of sludge buildup and odor. However, they are not confident that the municipality would be willing to invest in a network system, which they imagine would be very expensive. Andrea added that a new wastewater plan should not only remove wastewater from the community, but also treat it. Recycled water, he suggested, can be used for irrigation, and sludge from the treatment plant can be used as fertilizer. With regard to a disposal tariff and construction, Andrea and Valter said that they would accept both, specifying that they would be willing to pay around 100 lek (approximately 0.90 USD) per month for wastewater services.

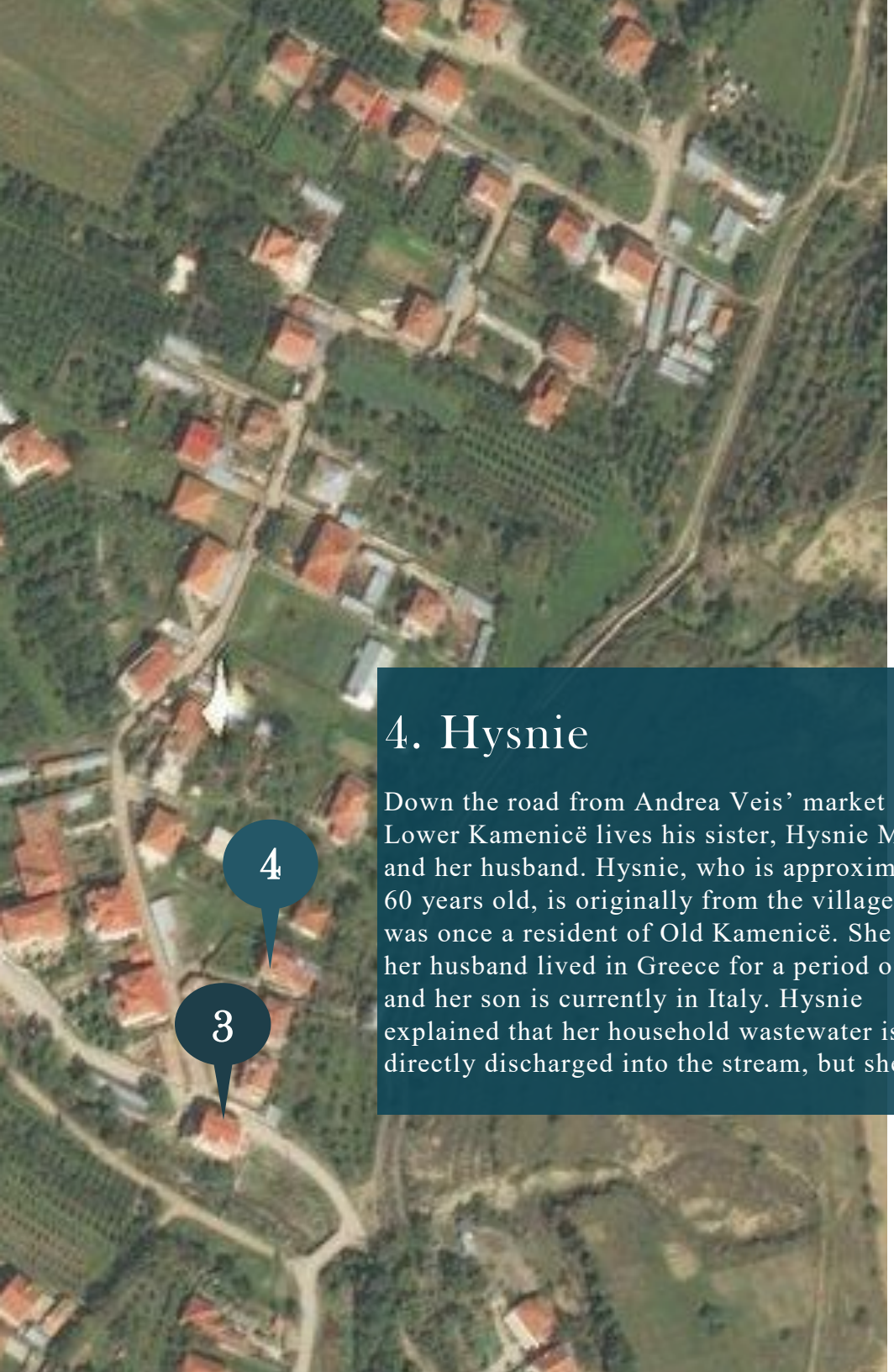
Lower Kamenicë

3. Andrea

Andrea Veis, who is in his 50s, owns a small market on the main road in Lower Kamenicë where he sells packaged foods and beverages, frozen meats, and various other daily necessities such as kitchen utensils, bathroom products, and school supplies. Andrea opened the market in 2011 when he returned to the village after spending 18 years in Greece. An old but seemingly sturdy brick building, the market serves as both Andrea's business and his home. He and his wife currently live on the second floor, which is accessible via an outdoor staircase. Directly behind the building is the muddy and rocky bank of the village stream.

Although Andrea has a septic tank on his property, he does not use it because of his proximity to the stream. Direct discharge into the water is simply more convenient for him even though he realizes that it is not environmentally safe. With regard to wastewater infrastructure development, Andrea expressed less optimism

than many others. He explained that development might be possible, but, because the village is so spread out, the project would require a very large investment. In addition, he stressed that the market is his only source of income, so the disposal tariff cannot be too high; around 20 lek (approximately 0.18 USD) per cubic meter would be reasonable for him. Andrea concluded with the argument that both water supply and wastewater disposal fees should be cheaper per unit volume for the rural population because rural residents need more and use more water than city residents.



4. Hysnie

Down the road from Andrea Veis' market in Lower Kamenicë lives his sister, Hysnie Mustafa, and her husband. Hysnie, who is approximately 60 years old, is originally from the village and was once a resident of Old Kamenicë. She and her husband lived in Greece for a period of time, and her son is currently in Italy. Hysnie explained that her household wastewater is directly discharged into the stream, but she does not wish to continue this practice because it results in odors, especially during the dry summer months. When asked her thoughts on wastewater infrastructure development, Hysnie stated that she would like to see a treatment system and would not mind paying a disposal tariff if that meant a cleaner stream and a cleaner village. Although she would like to have more detailed information, construction on her property would ideally be limited to the installation of pipes and not a septic tank.

Lower Kamenicë

5. Gani & Xhevaire

In their early 70s, Gani and Xhevaire Lika are lifelong residents of Kamenicë. Xhevaire's family roots in Kamenicë can be traced back to her grandfather, who was born in the village. They currently reside next to the school on the outskirts of Lower Kamenicë, where, after the fall of communism in the 1990s, they built a beautiful, single-story house that is set back from the road. Now retired, the Likas grow beans and corn on their property for food in order to supplement the government pensions they receive. Four of their children, who work in cleaning and construction in Greece, sometimes send remittances back home, but when times are tough, the Likas send money to them as well. Gani feels lucky that his children live fairly close to home and are able to come back to visit once or twice a year.

To store their wastewater, the Likas currently use a septic tank that Gani built using stone and concrete. He also built similar septic tanks for a couple of his neighbors as a kind gesture. According to Gani, these tanks are large enough that they do not require frequent cleaning. He also emphasized that he likes this current method of wastewater disposal because the system is entirely on his own private property. Still, Gani expressed support for wastewater infrastructure development, as long as a shared septic tank is not built on his property. The couple would even be willing to pay a disposal tariff if the municipality maintained the new system. Overall, however, they perceive no wastewater-related health issues in the community.

5

"... there can be construction on our property, but not for a septic tank"

-Gani Lika

Lower Kamenicë

6. Nazi

Nazi Medi, in his late 50s, lives with his wife in their medium-sized house in Center Kamenicë. Nazi was born and raised in Kamenicë and sells plants that he grows on his own property as a source of income. He also has two cows that he keeps in a small barn just outside of his house and a horse that he keeps on a nearby field. He makes yogurt with the milk from his cows and farms his field on the basin to produce supplementary food for his family.

To treat his wastewater, Nazi uses a septic tank which he built on his property using stones and concrete. He cleans it out once every two years and puts the sludge into the river. He explained that he does not want to use septic tank sludge as fertilizer, as he does not think it is safe and does not like the smell. Nazi explained that since the water in the river "takes it away," he does not see the problem with this method of sludge disposal. While Nazi has not attributed any human health issues in the village to wastewater exposure, he did say that he notices the fish in the river are dead. He does not, however, see the death of fish as a large problem, expressing that his main concern is just that wastewater goes away. He would be alright with a wastewater treatment system implemented by UKKO and expressed that he would be willing to pay a tariff to maintain the system. However, he does not think that everyone in the community could afford such a system.

7. Atika & Meti

Atika Hysen, a woman in her forties, lives with her husband Meti Hysen in a beautiful large house close to the village stream in Lower Kamenicë. Meti was born in Kamenicë while Atika moved there after the couple married. They have no children. Atika explained that the Hysens used to live in a much smaller house in Old Kamenicë, but they emigrated to Greece and Italy after the fall of communism and brought back money to build a new house in Lower Kamenicë so that they could have more living space and be closer to their fields. Atika works to maintain the family household. While Meti once owned his own fish farm, they have since closed this business, and he now works for another private fish farm.

The Hysens do not use a septic tank and instead pipe all of their wastewater directly into the nearby stream. Meti explained that although he is aware that it is not "good" to discharge wastewater into the river, they do so because he does not want to deal with the sludge and odors that come with using a septic tank. Neither Atika nor Meti have attributed any human health issues to contact with wastewater; however, Meti reported that he has seen dead fish in the village stream, attributing this problem to chemical toilet cleaners that end up in the discharge. He further explained that Kamenicë residents do not consume fish from this stream. Meti stated that he would like to connect to a wastewater treatment system managed by UKKO, and while he would be willing to attach to a shared septic tank system, he would strongly prefer a centralized system as he believes septic tank systems to be outdated. Meti expressed a wariness about having construction on his property to implement a treatment system, but the couple agreed that they would be willing to pay a tariff to maintain one. They believed, however, that other people in the village would not be as willing to pay.

Kamenicë Resident Profiles

"All the families discharge as they want and discharge whatever they want"

-Luli

8. Luli

Luli, a lifelong resident of Kamenicë, is in his mid- to late 40s and lives with his wife and child. Luli had two other children who have sadly passed away, one due to a congenital disease, and the other of cancer at age 18. The family lives in a medium sized house located at the top of a hill in Central Kamenicë. The house has a large front patio and a small garden where the family grows grapes. Luli is a day worker hired for different construction and landscape projects on a day-to-day basis. Although he worked abroad for five years, Luli was forced to return home to the village after facing pay cuts and certain familial problems.

Luli himself constructed the family's pipes and septic tank. The septic tank is located on their property and is used to treat both the household's blackwater and greywater. Luli is currently unsatisfied with the current wastewater management system in the community. He dislikes how families discharge what they want wherever they want. Although he states that he has not identified any wastewater related environmental or health issues in the village, he is concerned about this current system, as young children often play near the open drains (sometimes containing greywater) and the village stream (where some households dump blackwater). Luli cites this worry about the children of the village as his main motivation for wanting a unified wastewater treatment system. He stated that he would be willing to have construction for this system on his property, that his family would be willing to pay a disposal tariff, and that the rest of the community would be willing to pay this tariff as well.

9. Nesmir & Mimosa

Fifty-five-year-old Nesmir Jahia lives with his wife Mimosa and three of their four children in a medium-sized house in Center Kamenicë with a large garden and a small patio area. Nesmir, a past UKKO employee, was born in Kamenicë and has five brothers who live in the surrounding neighborhood. Mimosa moved here from a nearby village after she married Nesmir. The couple has a son who won the American visa lottery and currently lives in Boston, Massachusetts. Mimosa works to maintain the household while Nesmir works to maintain public spaces for the administrative office of Dvoran. He fixes street lights, keeps streets clean, and repairs roads.

Nesmir built the family's 27 cubic meter gravity septic tank, which he also cleans out himself once every few years. The tank was constructed from concrete and uses rocks and gravel as a filter. While Nesmir expressed a love and appreciation for Kamenicë, he would like to see a lot more work done to improve the village. Mimosa said that she would very much like to see a wastewater treatment system implemented, a view that Nesmir emphatically agreed with.

Although the two reported no cases of ailment due to wastewater contact, they raised the concern that especially when water levels are high, there is a health risk of residents coming into contact with the contaminated water. Nesmir expressed that the family is ready to pay a tariff for the maintenance of a wastewater treatment system and accepts that construction that will occur in the area.

10. Mukades

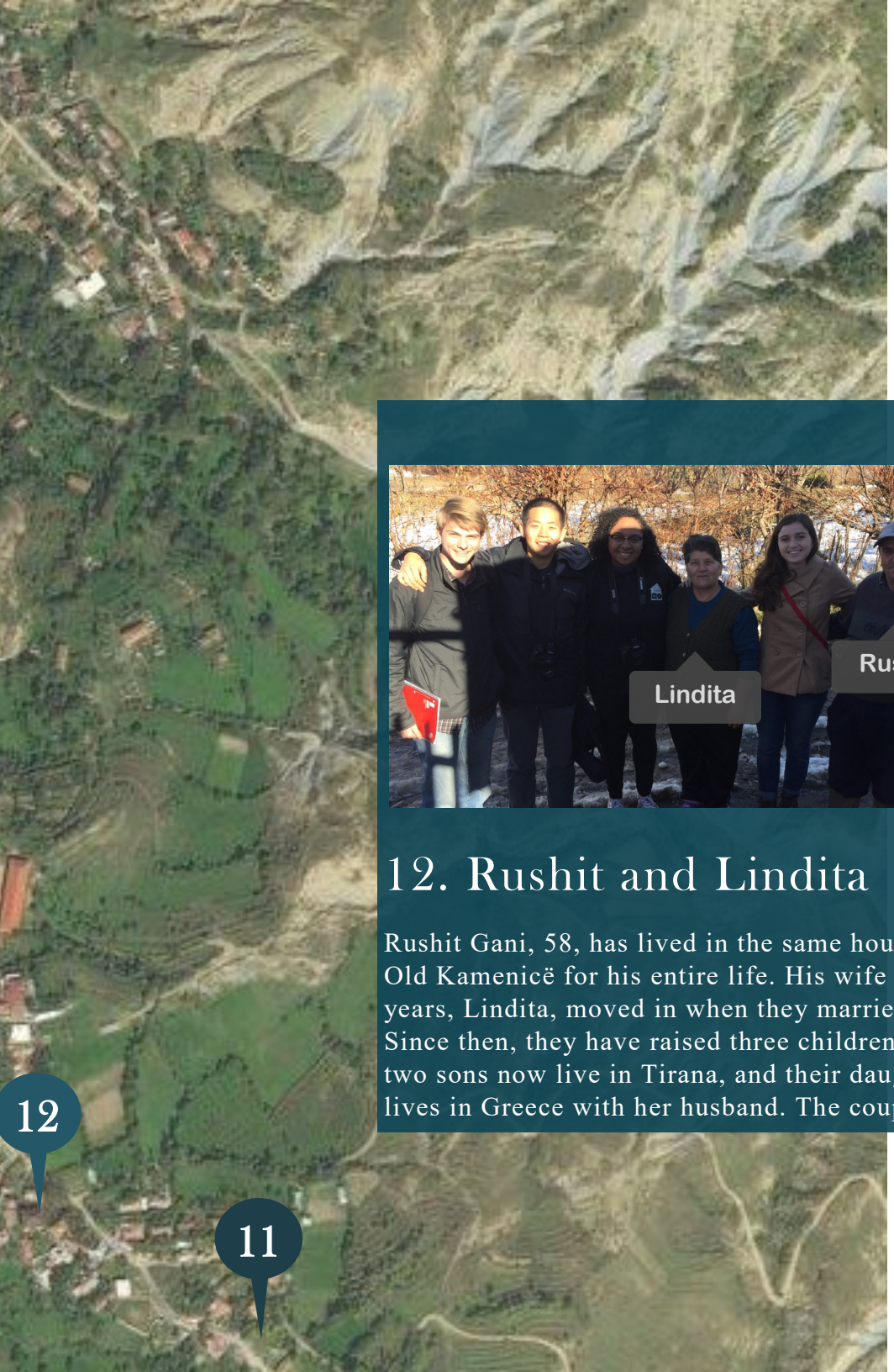
Mukades Veizi is 79 years old and has lived in Kamenicë her whole life. Once a resident of Old Kamenicë, Mukades moved to Center Kamenicë when she married. She has raised seven children and currently lives with her youngest son, who is aged 30. Their small, two-story home is situated at the foot of a steep hill and is only partially constructed; half of the building is unpainted and unfurnished, missing even windows and doors. Mukades washes her clothes at an outdoor faucet in the yard, and on a separate plot of land, she and her son keep fruits and vegetables which they rely on for food to ease their financial difficulties. Mukades receives approximately 70 USD per month in pensions, and her son is a day laborer.

Wastewater from the Veizi home is stored in a septic tank on the property that is cleaned out once every year or two. After drying the retrieved sludge, they use it to fertilize their crops. Mukades, however, is disappointed in the current wastewater situation in the village and would like to see the implementation of a formal, professionally-designed system, even if that means construction her on property. Despite this, she has never observed any wastewater-related health problems in the community. When asked if she would accept a disposal tariff, Mukades not only said that she would, but also emphasized that she is very diligent in paying all of her taxes on time.

11. Alida

Alida Bakollari, who is in her late 30s, moved to Old Kamenicë to live with her husband in his childhood home when they married seven years ago. From 2013 to 2015, the Bakollaris sought work in Greece but returned due to the declining economy. Her husband is now a farmer and works on the family's plot of land in Lower Kamenicë. They also grow some crops at their home for themselves and their two young children. They use water from nearby mountain streams to irrigate their land. As a result of financial difficulties and family conflicts with relatives living in the village, Alida and her family are unable to build a house in Lower Kamenicë to be closer to their fields.

From the Bakollari home, wastewater is currently piped to the village stream located down the hill from Old Kamenicë. Alida does not see any existing health epidemics related to wastewater, nor does she detect any odors. Still, she stated her interest in wastewater infrastructure development and said that she would pay a tariff because she wants to see a cleaner and more aesthetically pleasing community environment.



12. Rushit and Lindita

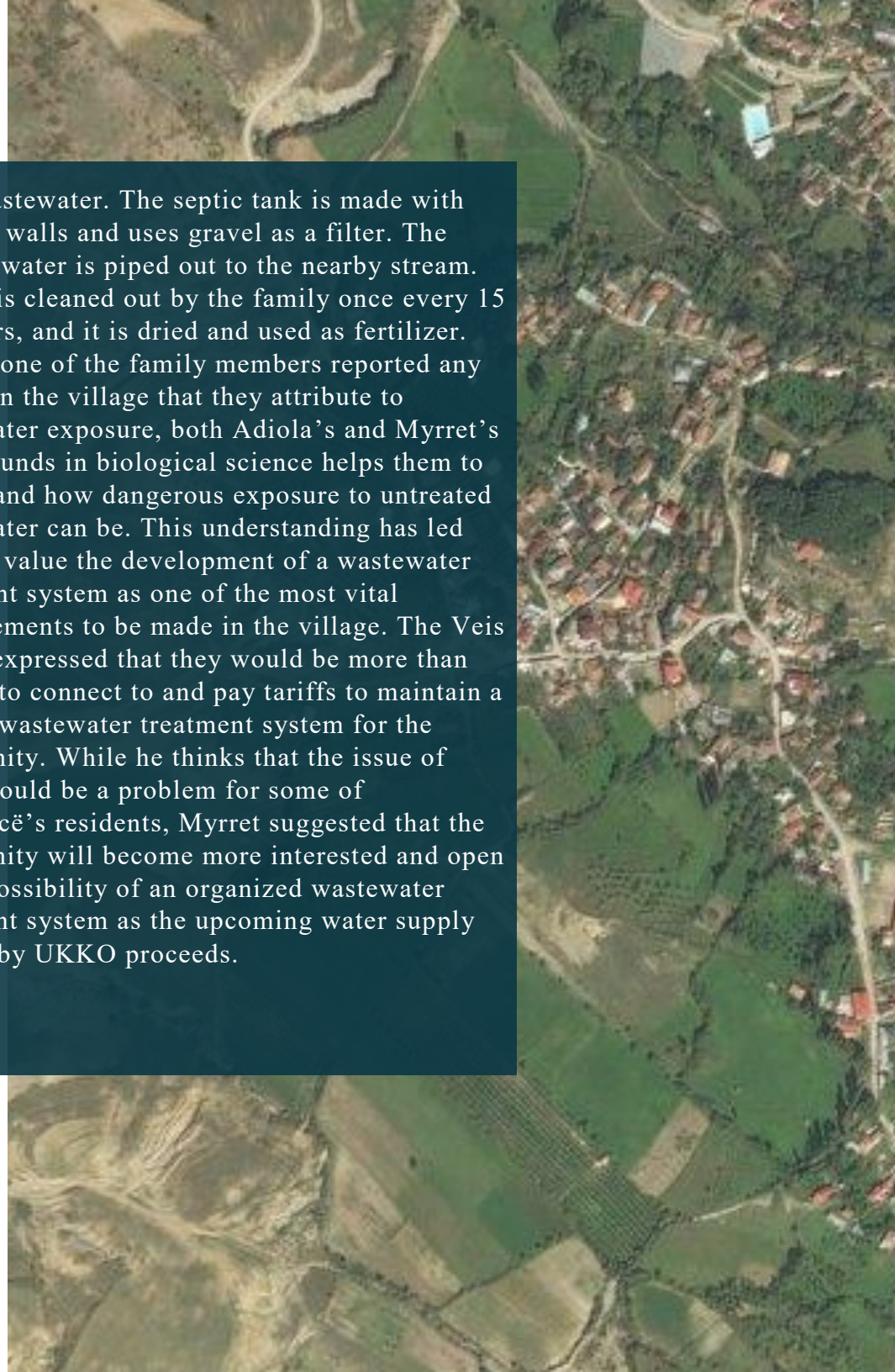
Rushit Gani, 58, has lived in the same house in Old Kamenicë for his entire life. His wife of 35 years, Lindita, moved in when they married. Since then, they have raised three children; their two sons now live in Tirana, and their daughter lives in Greece with her husband. The couple are currently unemployed, but Rushit grows food in the family's small field, and they find this to be sufficient for their needs. In addition, they sometimes receive remittances from their sons. Lindita told us that they truly enjoy life in Kamenicë and would not want to live anywhere else.

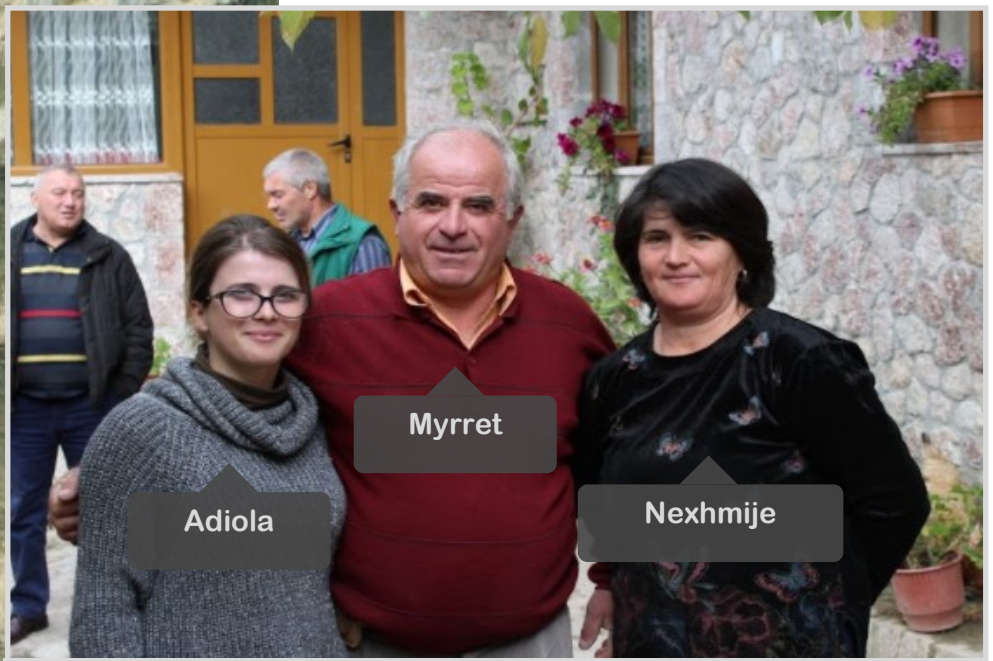
The Ganis use a septic tank that they built themselves. Once a year, they clean out the sludge and use it as fertilizer in their fields. Wastewater treatment development is not necessary in their opinion because they see no issues with their current practices. Improved water supply and paved roads, on the other hand, are much more urgent. The couple may agree with the installation of a network sewage system and pay a reasonable tariff, but they are unsure when such a project would be executed.

13. Veis Family

The Veis family consists of 55-year-old Myrret Veis, his wife Nexhmije, and their 23-year-old daughter, Adiola. The family lives in a beautiful, white house overlooking Old Kamenicë Adjunct. Behind a metal gate, a stone pathway leads to a large patio in front of the house. There are colorful chicken coops, wooden beehives, and flowers, vines, and fruit trees. The two-story house is the largest building in the area and is well maintained. Myrret told us that his house was built more than 100 years ago and was passed down from his parents. A retired veterinarian, Myrret explained that in Kamenicë, it was traditional to have a village elder to whom others could go for help. In modern Kamenicë, he is the person who fulfills this responsibility, receiving reports of any issues in the community and communicating them to the municipality. Nexhmije is responsible for the care of the garden and keeps the family's bees. Adiola is a graduate student pursuing her master's degree in biology in Tirana.

The Veis family has a gravity septic tank that they built on their own property to treat all of their wastewater. The septic tank is made with wooden walls and uses gravel as a filter. The filtered water is piped out to the nearby stream. Sludge is cleaned out by the family once every 15 -20 years, and it is dried and used as fertilizer. While none of the family members reported any illness in the village that they attribute to wastewater exposure, both Adiola's and Myrret's backgrounds in biological science helps them to understand how dangerous exposure to untreated wastewater can be. This understanding has led them to value the development of a wastewater treatment system as one of the most vital improvements to be made in the village. The Veis family expressed that they would be more than willing to connect to and pay tariffs to maintain a unified wastewater treatment system for the community. While he thinks that the issue of tariffs could be a problem for some of Kamenicë's residents, Myrret suggested that the community will become more interested and open to the possibility of an organized wastewater treatment system as the upcoming water supply project by UKKO proceeds.





"I think people will be very open minded to give their property to this construction"

-Myrret Veis

Old Kamenicë Adjunct

5. Emigration and Movement

Andrea Medi recounted how the collapse of communism and rise of democracy in the early 1990s impacted the Kamenicë community, stating that people could finally "work for [the] self" and own private property. The change in government allowed for the freedom to travel to other European countries. In the mid-90s, Meti and Atika Hysen left their home in Old Kamenicë to seek work in Italy and Greece. Atika explained that after she and her husband earned enough money abroad to live a "comfortable" life, they returned to build a new home in Lower Kamenicë. She emphasized that they were not alone in this pursuit of financial opportunity abroad. Andrea Veis, for example, left Old Kamenicë in 1993 and spent 18 years working in Greece. When he returned to the village, he had the financial means to open his market in Lower Kamenicë.

It is not a coincidence that both the Hysens and Andrea Veis chose to settle in Lower Kamenicë upon their return from abroad. The fall of communism also set off a wave of movement within the village. According to Gani Lika,the new government divided village land into plots in the 1990s. These plots were then awarded to families based on household size. In turn, people were free to build new homes on their private properties, like Gani and Xhevaire did after abandoning their former home in Old Kamenicë. Other factors also pushed residents to move out of Old Kamenicë. Andrea Veis, after his time abroad, chose not to return to Old Kamenicë because his property there had limited space and was not accessible by car. He explained that the current road conditions are suitable for only horses and donkeys. Andrea's sister, Hysnie Mustafa, lives near the market in Lower Kamenicë, and like her brother, she also left Old Kamenicë because there are no paved roads. On the other hand, the Hysen couple settled in Lower Kamenicë because they wanted a bigger house located closer to their agricultural fields; large, flat fields are located exclusively in Lower Kamenicë.

Majlinda Like, the nurse at Kamenicë's medical clinic who has lived in the village since childhood, explained that during Albania's communist era, there was a lot of order in the community. Specifically, she described how every household had a septic tank, which, according to Andrea Veis, was required by law at the time. After the collapse of the regime, people began to build wherever and however they pleased, and new homes would be constructed without septic tanks. Of the five Lower Kamenicë interviewees known to have moved from Old Kamenicë, two stated that they did not install a septic tank and therefore discharge wastewater directly into the stream. And due to the convenience of his close proximity to the stream, Andrea Veis also discharges wastewater directly even though he has a septic tank.

The house of a resident who moved from Old Kamenicë to Lower Kamenicë

6. Perceptions of Health and Environmental Risk

Photo of the Stream that runs through Kamenicë, which some residents directly discharge their wastewater.

UKKO representatives were not overly concerned about the impact of Kamenicë's wastewater on the environment. Marsida Sterjo, UKKO's hydraulics engineer, explained that the stream the residents discharge into is not connected to any large bodies of water, which limits the potential environmental impact that untreated wastewater could have. However, two residents we interviewed, Meti Hysen and Nazi Medi, reported seeing dead fish in the village stream. Meti, who works in the fish farming industry, guessed that fish die due to the release of toilet cleaners into the village stream along with blackwater. Both residents, however, assured us that no one in the village consumes fish from this stream.

Majlinda, the village nurse, confirmed what we were hearing from many other residents, stating confidently that there had been no health issues associated with wastewater since she started her career at the clinic in 2000. Even though she and other residents had not witnessed or suffered from contact with wastewater, they are aware of its potential to cause human health problems. Majlinda explained that direct contact with wastewater could result in the contraction of infection, hepatitis, and diarrhea, emphasizing that the current situation is risky, particularly for small children who might touch or play with wastewater and not wash their hands. Others also expressed a concern for human health despite the perceived lack of current problems. Nesmir said that "a system is necessary because wastewater contains pollutants that are not healthy to become exposed to." Myrret Veis expressed concern for the health risks that "come from improper collection," and Luli emphasized a concern for the safety of the community's children because they "play near the contaminated water."

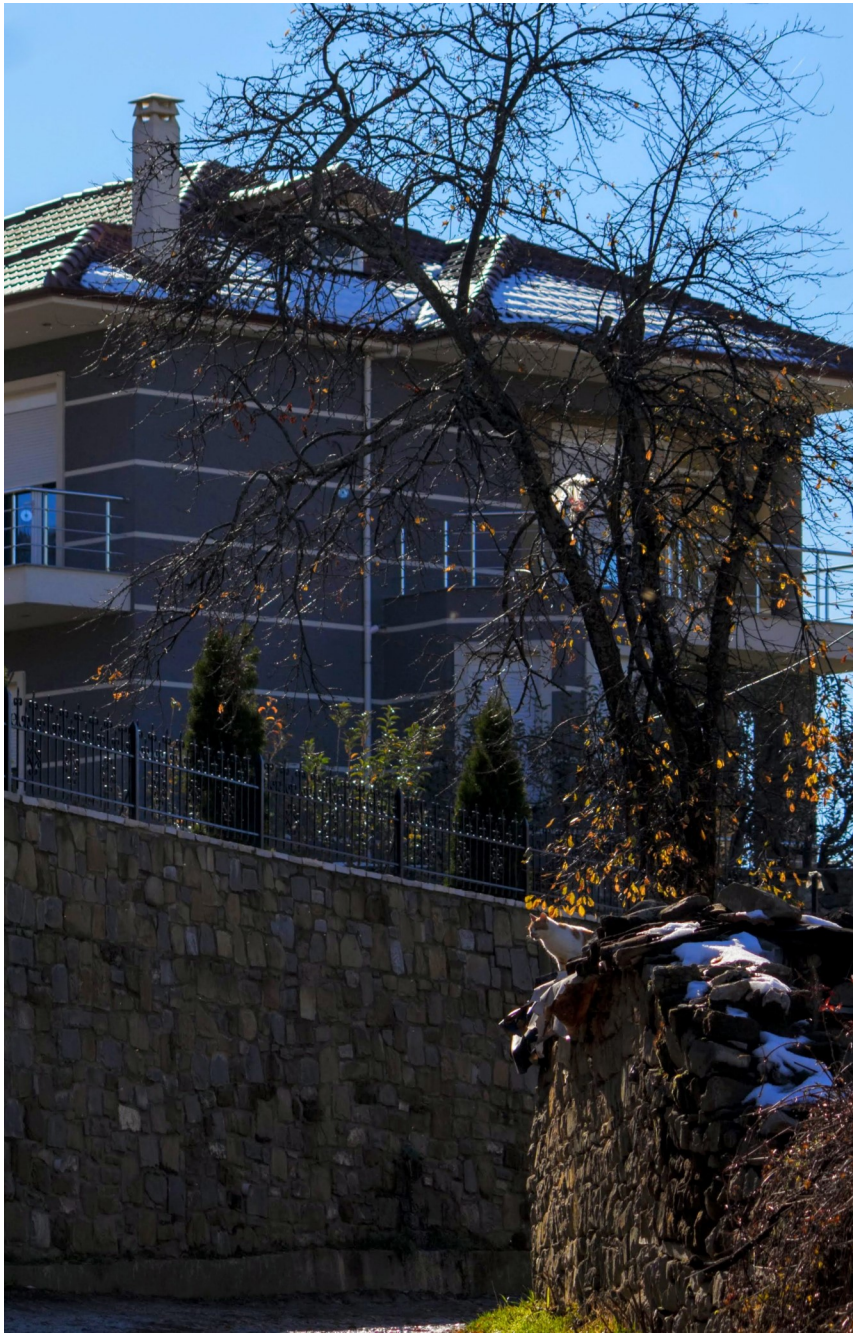
There is a pattern of concern for risk of future contamination despite seeing no noticeable health issues. Majlinda said that even though there are no current observable problems, people are still worried for the future. She identified the concern that more people were moving into the newer houses in Lower Kamenicë, where discharging wastewater directly into the river is more common.

7. Desire for a Higher Quality of Life

There is a sense that Kamenicë residents strive for progress both at home and in the community. Family members display obvious pride in their homes, many of which are beautifully constructed with rustic stone walls, vine covered terraces, and well-maintained gardens. Kamenicë residents seemed to be in a constant state of home improvement. Both Luli and Nesmir expressed that they often return home from work only to begin working on home-related projects, and the majority of interviewed households spoke of upgrades and renovations that had been completed in the past.

Residents suggested that changes in infrastructure, including a change in the wastewater treatment system, is desired for at least partially aesthetic reasons. Many residents expressed the desire for a system where they would not have to see or smell wastewater. Hysnie Mustafa notices and dislikes the smell of the stream where families discharge their waste. The smell, she said, is especially bad in the summer when there is less rainfall.

Aside from aesthetic beauty, many residents of Kamenicë desire general modernization of the community. Lindita Gani was very keen to see the roads paved in her neighborhood. Mukades Veizi said she witnessed substantial support when the roads were paved in Center Kamenicë. Nico Hysen summed up this desire for progress by saying that they feel as though they should have the same basic amenities as any other country in the European Union.



Household under renovation in Center Kamenicë.

8. UKKO's Proposed Plan

UKKO and the municipality plan to pursue a future wastewater treatment project in Kamenicë. However, they are currently focusing on providing a 24-hour clean water supply to Kamenicë. The proposal for water supply has already been submitted and approved, but the proposal for wastewater treatment has not yet been developed, and the planning process is still in its preliminary stage. Marsida Sterjo, the hydraulics engineer at UKKO, speculated that the utility will begin the water supply project in March 2018 and that it is likely to take about a year to implement. She also stated that the wastewater project probably won't happen "for a long time." The mayor of the Korçë Municipality, Sotiraq Filo, said "having a clean water distribution service is the main priority," though when asked, he also agreed that it would be ideal to lay wastewater and water supply infrastructure at the same time. The mayor indicated that the wastewater treatment project lacks funding, but the aim of UKKO and the municipality is to use funds from both the local and central government, take out low interest loans, and secure grants from outside investors, such as the KfW Development Bank, which funded the wastewater treatment project in urban Korçë.

Four independent consulting firms conducted a feasibility study for UKKO that determined a potential plan for the village. Based on this study, the utility intends to implement a cluster system for the village in which multiple families share septic tanks that are built and maintained by UKKO. The feasibility study calls for the use of several 40 cubic meters tanks that can service 40-50 households. From Ms. Sterjo's participatory mapping exercise, shown in *Figure 16,* we learned that UKKO would install five to six septic tanks within the village. One of these septic tanks would serve Old Kamenicë, one would serve Old Kamenicë Adjunct, one would serve Center Kamenicë, and the rest would be used within Lower Kamenicë. *Figure 17,* on the following page outlines the potential system for Old Kamenicë.

Figure 16: Participatory Map Completed by Marsida Sterjo

Figure 17: Village System Layout
Retrieved from Posch & Partners Consulting Engineers et. al. (2017)

Each septic tank would have two chambers with a filter between them. Water would be able to travel through the filter, leaving the sludge in the first chamber. Ms. Sterjo explained that the wastewater that travels through the filter (a form of primary treatment which removes all large particulates), would then be disposed of in nearby waterways. UKKO would collect the sludge every one to three months and transport it to a plant that is projected to be located in the neighboring village of Dvoran. There it would receive secondary treatment. A scheme of the septic tank design can be seen in *Figure 18*.

UKKO is aware of some obstacles in implementing the plan, and thought is being given as to how to address them. One issue is with the layout of areas on the outskirts of Lower Kamenicë where houses are more dispersed. UKKO may require each of these households to have their own individual septic tanks, which UKKO would service. Topography is another problem in Lower Kamenicë. This area of the village is relatively flat, which makes the drainage of water from the septic tanks more complicated and costly, as gravity cannot be used to naturally move the water.

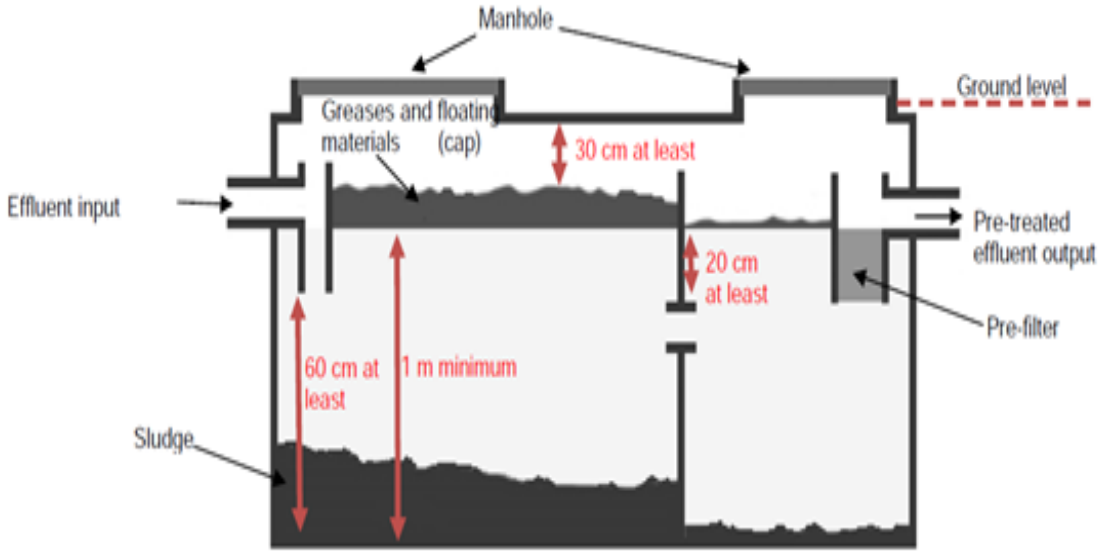


Figure 18: Design of Potential Septic Tank to be Installed by UKKO.
Retrieved from Posch & Partners Consulting Engineers et. al. (2017)

In order to maintain the wastewater treatment system after it has been installed, UKKO plans to impose a tariff on the residents who are connected to the system. UKKO is not yet able to determine the actual rate because, as Elia Pendavinji, the Commercial Director of UKKO, explained, the type of collection system -- such as a network or a cluster system -- and the size and type of treatment plant UKKO installs will directly affect the tariff structure. Networked systems can be costly due to the necessity for electric water pumps, and, according to Seyla Kokojka, a UKKO chemist, treatment plants that use chemical treatment are typically more costly because of the associated chemical costs. As UKKO is aware, the topic of tariff rates can greatly affect the tone of the conversation between the service provider and the community. Elisabeta Poçi, Deputy Executive Director of the Water Supply and Sewage Association of Albania, suggested that the social dynamics of tariffs are difficult to navigate because while the utilities and government understand the need for tariffs and their occasional increase, government officials often avoid tampering with them to maintain popularity with the people and increase their chances at reelection.

UKKO has already started the conversation with residents on a future wastewater treatment system. Ediola Osman, head of UKKO's public relations department, stated that UKKO has already started to hold public hearings, which are required by law. These hearings allow the utility to talk to and hear from community members about project objectives and plans to implement any project. The hearings also allow the community to give feedback; Ms.Osman gave these examples: "Do they wish these things to happen to them?" "Are they in contrary to these?" "Do they like it?" She related that, much to the company's surprise, attendance by community members was very high. Ms. Osman recounted that hearings held to discuss changes in Korçë city's system often struggle to obtain a large attendance from urban residents. She believes this may be because residents from Kamenicë "are more concerned, [because this is] something that touches them in their life, and they come with so many questions." She also described how "sometimes [community members] even [have] debates: 'I don't want this!,' 'We have this problem,' 'Why should we focus on this problem?'" She believes that, for the most part, Kamenicë residents are excited about the prospect of having regulated wastewater treatment installed.

9. Opinions on UKKO's Plan

Overall, households reported that they want the installation of a wastewater treatment system in Kamenicë. Despite this interest, there were areas of disagreement when residents were asked about their acceptance of various aspects of UKKO's plan

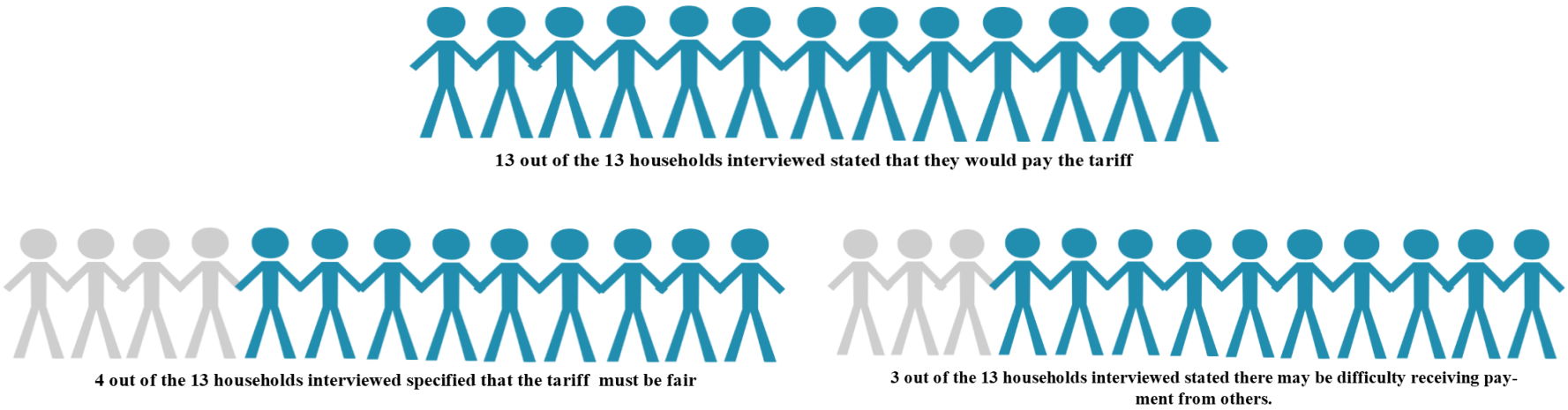


Figure 19: Resident Support of Potential Tariff

9.1 Opinions on Tariffs

All 13 households interviewed stated that they would be willing to pay a wastewater disposal tariff (*Figure 19)*. Many residents expressed the idea that nothing could be done without money, and they accept that they need to pay to maintain their community. While many understand that a tariff is necessary, some residents stressed that the tariff should be "fair." Andrea Medi, Andrea Veis, and Nazi all provided example tariff rates they thought would be fair. The collective belief between these residents is that the tariff for wastewater treatment should be less than the tariff for water supply, which is currently 30 lek per cubic meter (approximately 0.27 USD). These payment concerns extend to fellow residents. There was concern that some residents would not be able to pay high tariffs due to financial difficulties. Nazi stated that a tariff above 19 lek per cubic meter (approximately 0.17 USD) may be too high for some members of the community. Various interviewees said they thought that some residents would be unwilling to pay, in part because they are content with the way things are and don't have any problems with the current wastewater situation in the village.

9.2 Opinions on Construction

The issue of construction is a concern for some residents. Nazi Medi, who uses his property to grow plants for profit, is opposed to construction on his property as it would directly impact his income. Nazi is not alone in his aversion to construction. Meti Hysen expressed apprehension to construction on his property, which is well-kept and has large stone pathways throughout. Unlike Nazi, his feelings were not tied to the potential loss of an income source but rather to the preservation of his own property's infrastructure. The Lika family does not want one of the shared septic tanks to be placed on their property, an opinion shared by Hysnie Mustafa.

" Without money, we can't do anything."

- Nico Hysen

9.3 Opinions on Use of Treated Sludge

The use of fertilizers was common among residents who tended fields. Many households use sludge from their septic tanks to make their own fertilizers; other employ alternative methods such as using store-bought fertilizers or cow manure. In some conversations, the prospect of using treated sludge provided by UKKO arose, and respondents stated that they would use the treated sludge if it was provided. This is a point of particular interest, as UKKO is currently in the process of making their treatment facility in Korçë city capable of treating sludge. If this project is successful, they may provide local farmers with free fertilizer. The prospect of free, treated fertilizer may be a good way to increase system acceptance in an agricultural community like Kamenicë.

9.4 Opinions on Shared Septic Tanks

Meti Hysen chooses to directly discharge into a nearby body of water because he believes that septic tanks are not a good solution to the wastewater problem. Meti expressed disagreement with the installation of septic tanks, even with the prospect of UKKO assuming the role of maintenance. He believed the village would benefit more from the construction of a network system, an opinion shared by other residents. Andrea Medi, while he thought septic tanks are undesirable due to the buildup of sludge and odors, expressed his understanding that a network system is a larger investment and may not be possible due to limited funding. All of these residents, though strong in their opinions about what would be the best system to install, also conceded to the ideas of shared septic tanks if it was the only viable solution.

9.5 Discussion of Opinions and Perceptions

When we examined opinions alongside the perceptions of community members on wastewater infrastructure development, we found an interesting dynamic between their desires and what they are willing to sacrifice for them. The resident who expressed an understanding that his direct discharge into the river is negatively affecting the environment had strong opinions on the inadequacy of septic tanks. Residents who expressed that a network system would be a better solution to the problem also expressed the importance of a reasonable tariff, which would likely be higher for a network system. While the respondents we interviewed were knowledgeable on the subject of wastewater, with many expressing that the need for a system was in part due to the risk to health the unregulated systems pose, there may be a lack of knowledge on the associated technical and financial aspects of a new system. Some respondents suggested that an educational campaign may be necessary to inform the community about the importance of wastewater treatment and thus increase acceptance of different aspects of the plan. Adiola Veis, a biology student currently pursuing her master's degree, was especially vocal on the need for an educational campaign for those residents of the village aged 45 and up. This informative discussion illuminated her perception that the younger generation, which includes high school and college students, were more informed on the environmental issues and would be more open minded toward a new wastewater treatment system. Her father, Myrret, interestingly, believes that a campaign should "emphasize the public health risks of untreated wastewater.".

Conclusion

Our case study on Kamenicë explored the social perceptions of community members toward the current state of wastewater in the village as well as the plans proposed by UKKO to improve wastewater treatment infrastructure. This study is intended to assist UKKO in better understanding the complex social dimensions of their work. Additionally, we hope this study serves as an example of an effective framework for social research that can be referenced by other public service providers during the planning phase of future projects. Below, we summarize our case study and examine the limitations of our data as well as the ethical dimensions of our research. We discuss the significance of this study and provide an overview of factors we believe are worthy of consideration during public service development projects in Kamenicë and elsewhere.

In this Section:

1. Summary of Case Study

Kamenicë has three distinct geographic and socio-economic regions: Old, Center, and Lower. The economy of Kamenicë is largely agricultural with apples and cherries being common exports. Along with commercial agriculture, many residents also grow personal crops and keep livestock. Residents expressed a strong connection to Kamenicë as a community as well as an appreciation for its natural beauty.

Interviews with community residents revealed that a significant percentage of the working age (approximately 18 to 40 years old) population emigrate to other countries, mainly Greece, for work. The mass emigration of young adults has resulted in a polarized age demographic in the community, as the population consists mainly of children and older adults. Families that emigrate sometimes return to Kamenicë to construct a new house in the flat agricultural land in Lower Kamenicë. During the communist era, this lower land was designated for farming, but upon the arrival of democracy, Kamenicë residents had the option to move their homes down to the basin. Both return from emigration and movement within the village mark a trend of leaving Old Kamenicë for Lower Kamenicë.

A high degree of self-sufficiency exists within the community. Residents, through a combination of internal drive to progress and a lack of government involvement, often build their own homes and sewer systems/septic tanks. Many of the houses located in Old and Center Kamenicë, away from the village stream, utilize self-built septic tanks which consist of hand-dug pits lined with concrete, wood, or dirt, with a base-layer of gravel. These are gravity septic tanks which either let filtered water disperse in the soil beneath or get piped out to the village stream. Most residents clean out the sludge from the septic tank once every few years, and many of them dry the sludge and mix it with animal manure to use as fertilizer. In contrast, the newer houses in Lower Kamenicë are closer to the village stream and forego the use of septic tanks to instead discharge their wastewater directly into the stream. Of the residents who do not use septic tanks, many said that direct discharge is more convenient, and not having a septic tank also means not having to monitor and maintain one. Others cited concerns with aesthetic appeal and odors as reasons why they did not build a septic system for their property.

There are many chickens that roam freely around the village.

UKKO's plan for wastewater treatment in Kamenicë is to build a centralized treatment plant in a neighboring village, Dvoran, and a cluster system of septic tanks in Kamenicë. The sludge from the septic tanks in Kamenicë would be periodically removed by UKKO and transported to the central treatment plant in Dvoran. UKKO intends to apply for funds and low interest loans to cover the initial development costs and then to implement tariffs in Kamenicë to cover operational costs of the system. UKKO's current priority is to build a system to supply clean water to the village. This develop-

ment will take place within the next year, and any plans for the development of a wastewater treatment system would follow.

UKKO representatives categorized the environmental risk of the contaminated village stream as low, as it does not connect to any large bodies of water. However, there were residents who reported dead fish in the river. Residents did not report any current health issues related to wastewater exposure, although many expressed concern about potential exposure.

There is a general desire to develop better infrastructure throughout the village, including a sewer systems and paved roads. The majority of residents we spoke with accepted that construction on public and private property is a necessary condition of community improvement. It should be noted that some residents grow crops on their property to sell, and construction on such property could result in the loss of income. Every head of household we interviewed expressed a willingness to pay a "fair" tariff for the maintenance of a treatment service. However, many residents warned that some members of the community would not or could not pay a tariff for wastewater treatment services. A small pool of residents believed that the installation of a system is not feasible due to the difficulty of connecting such a spread-out village. Other residents worried that the necessary investment would not be realistic for the municipal government. Some residents believed that a system of shared septic tanks is not the best solution for the community, instead hoping for a centralized network system. Others see wastewater treatment as a lower priority as they would like to see investments into the paving of more village roads before the installation of wastewater treatment systems.

Self built wall outside of a residents house.

Curiosity

Curiosity drove much of our research. For example, we realized early on that residents would often refer to an "old" section of the village, one that we had not seen before. The will to understand the "old" part of the village led us to explore this area despite concerns from our guides that it was far away and difficult to travel to. Our exploration of this region of the village prompted additions and modifications to our approach, such as our participatory mapping exercises and our stratified-convenience hybrid sampling strategy. This ability to compare and contrast three distinct regions of Kamenicë led to multiple interesting revelations relating to community development, socioeconomics, internal migration, etc.

2. Limitations of Data

This case study is informed by 13 interviews with the residents of Kamenicë, in addition to UKKO employees and local officials. While this research method was appropriate in that it provided deep insight into the physical and social community of Kamenicë, we also faced certain limitations. First, none of the members of this IQP team have sufficient language skills to converse in Albanian, and only one of the interviewees in the village could speak English. Communication occurred almost exclusively through an interpreter. The interpreters themselves were not entirely fluent in English, and errors in translation were inevitable. Such errors include: (1) mistranslations of words and phrases; (2) misinterpretations of our questions; and (3) non-verbatim translations of our questions and participant responses. For this reason, our data may contain inaccuracies; however, we do not believe that the language barrier impacted our research as a whole or our understanding of the people and systems in Kamenicë.

Residents were selected for interview via a hybrid form of convenience sampling and stratified sampling. We acknowledge that as a non-probability sampling method, convenience sampling does not necessarily produce data that is representative of the entire population; data cannot be used to make valid inferences and generalizations. However, the generalization of data was not a part of our data analysis, and no inferences were made about the community as a whole.

Our data was used to construct a case study of Kamenicë in the context of current circumstances and UKKO's wastewater treatment plan and should not be used to make assumptions or inferences about any other cases. This case study is intended to provide UKKO with information on social perceptions in Kamenicë and to establish only an example of how future research in similar topics can be conducted.

One segment of the population that was left out of our research was the young to middle-aged population (those under the age of 40). All of our interviewees, with the exception of two, were over 40 years old; we simply did not encounter any potential participants outside of that age demographic, possibly due to the time of day, the days of the week, or the time of year that we visited the village. This exclusion is noteworthy because if UKKO were to implement a wastewater treatment development in the near future, and young to middle-aged residents return to the village (which has been an observed social trend), then UKKO's work would directly impact their daily lives.

3. Ethical Dimensions

Our many conversations with Kamenicë residents about wastewater and wastewater treatment inherently implies that the wastewater situation is an issue in the community. Prior to our arrival, however, perceptions of the wastewater issue may have in reality been small or even nonexistent. In other words, there is the possibility that we elevated or created a sense of concern amongst the residents. Although this ethical problem was not completely preventable, we took certain measures to limit its effects. For example, we asked interviewees about non-wastewater-related issues that they have observed in the community. We believe this eliminated the sense that, to the outside world, wastewater is not only a major concern but also the only concern in Kamenicë. At the same time, we did not want to create the impression that Kamenicë is underdeveloped and full of problems, so we also discussed with residents the positive aspects of life in the community. We also shared with them our positive impressions of and experiences in the village.

Furthermore, we were aware that as foreign engineering students, we may be perceived by the Kamenicë community as a sign of change in the very near future. However, our work did not concern the physical implementation of UKKO's plans for infrastructure development. We believed that in order to maintain the ethical standards of our work, it was critical for members of the community, who are stakeholders in both our study and UKKO's project, to be made aware of our objectives. Prior to our interviews with local residents, we provided a brief but carefully planned introduction of ourselves through an Albanian interpreter. We were careful to choose wording to clarify that our research does not imply the installation of wastewater treatment systems, but we cannot be certain that the information was accurately conveyed or understood.

Another ethical concern we had was our relationship with UKKO. Although we worked closely with the utility, were always accompanied by its personnel when on site, and conducted our fieldwork in the context of its future infrastructure projects, we were still independent researchers. We therefore asked our interpreter to clarify with

each interviewee our status as foreign students working with UKKO. Likewise, we made certain to not act as advertisers for UKKO's proposed wastewater treatment plan. Although it was necessary to share this plan with interviewees in order to ask for their opinions, we did so in a purely descriptive manner that offered no insight into our perceptions of the plan, whether positive or negative. We also encouraged participants to share ideas that did not necessary align with UKKO's plan. A related ethical consideration is our treatment of UKKO's plan, specifically how we address instances in which our findings brought certain aspects of the plan into question. Throughout this project, we viewed the plan from a critical and objective perspective; we hope that by examining our case study and conclusions, sector professionals at UKKO will recognize areas of their plan that require modification in order to better address the social considerations of wastewater treatment development.

It was also ethically important that we treated interview participants with dignity and respect. Because we were constructing a case study, we often delved deep into the personal backgrounds of our interviewees. We recognized that certain matters (e.g., financial status or family conflicts) are private, so it was necessary to limit the depth of our exploration and to be constantly aware of the emotional status of the interviewee. Changes in tone, responsiveness, facial expression, or body language were all treated as potential signs of caution when discussing sensitive issues. Furthermore, we tried to carefully phrase our questions to not imply criticism of the interviewee's lifestyle. For example, discharging wastewater directly into a stream may be viewed negatively by modern societies, but during conversations about these potentially controversial topics, we kept a neutral stance.

Connections

Our team members come from areas with regulated wastewater treatment systems, so it is difficult for us to imagine life without one. However, as we started to talk with residents, we realized that people had been living without such a system for generations. If implementing a regulated wastewater treatment system means long-term construction and financial burdens, but offers no noticeable improvements in return , then residents may be happier to go on living without one. As engineering students, we came into this project thinking that implementing a wastewater treatment system simply means adding protection against human and environmental contact with wastewater. However, we saw that for many of the village residents, improvements such as the aesthetic appeal of a new system and a feeling of community progress were equal and sometimes greater concerns. For the future, we are now better prepared to understand why it is so important to look at a project from both the engineering side as well as the social side. We can use our experiences from this project to broaden our ideas about the importance and impact of our future academic and career endeavors.

4. Thoughts for UKKO and the Sector

Through this case study, UKKO and other utility providers may gain valuable information on effective ways to approach infrastructure development in rural communities. We believe it is vital to understand that a community is not a single, homogeneous unit. Neighborhoods, households, and individual people have their own histories, experiences, and lifestyles. Our dissection of Kamenicë revealed this complex, multilayered community. Yet, we view a community as a collective whole not only because of geographic boundaries but also because its diverse components have a natural bond. While it is financially and logistically impossible for public service providers to take into account the opinions of every single one of its customers, an effort should still be made to avoid disrupting the bond of a community.

It is our view that utilities should take into account the overall self-sufficiency of the community they are entering. Kamenicë is a community where residents have been independently dealing with wastewater. While our case study suggests that residents are open to the idea of a wastewater treatment system, they are experienced in handling domestic and agricultural waste and will have opinions on what is the right way to address the situation. These opinions may or may not align with UKKO's plan. Because residents have not identified any serious issues that arise from their current wastewater solutions, they may not perceive an urgent need for a new treatment facility and may resist decisions of the utility. When considering rural areas, we would suggest that a utility assess the ability of the community's residents to independently deal with the situation. This can provide insight into the urgency residents will feel for a new system and their willingness to accept and pay for the proposed change.

Utilities should be aware of a community's level of infrastructure development prior to implementing new projects, because much like our case study suggests, this can

The sign pointing you in the direction of Kamenicë.

Photo of the clinic within the village.

cause variations in opinions on how critical the implementation of the plan is. For example, in Old Kamenicë, residents saw greater importance in the installation of roads than in a wastewater treatment system. The utility should also take into consideration how the construction of a wastewater treatment system will affect the residents. If the community uses land as a resource, then long construction processes may begin to affect people's livelihoods and create frustrations. The combination of the perception of system urgency and the speed of construction are especially important to take into consideration for areas in which there is no public land (and the utility will be forced to construct on privately owned properties). Residents who feel that the project is currently unnecessary, or will take too long to implement, may not offer their property up for use, which can jeopardize the feasibility and success of the project.

Gauging the demographics of the community will also aid in the process of constructing a publicly accepted plan as well as any educational campaigns aimed towards increasing acceptance. The Kamenicë community has a large elderly population that has seen little to no issues over the years with regard to wastewater. They may in turn be very well accustomed to their long-established lifestyles and may be more resistant to change. This affects the approach a utility may want to take in informing residents and gaining system acceptance. System acceptance is important for both the residents whose daily lives will be affected by the system and for the utility who depends on customers' willingness to pay for the system's operation and maintenance. The distribution of wealth within the community is also an important element to remain aware of. Kamenicë has a range of socio-economic statuses, with residents who rely on pensions, find work day to day, or have steady jobs. This distribution can affect the ability of residents to support tariffs associated with a new system. Considerations of system type should in part reflect the rate which residents are capable of paying.

Understanding community motivations can also prove beneficial for system development. In Kamenicë, aesthetics was a common theme in conversations about home and community improvement. Awareness of this desire for an aesthetically appealing village may help UKKO determine what kind of system to implement so that the project is worthwhile to the residents from this perspective.

Finally, utilities should foster a transparent relationship with customers. Depending on the success of past projects in the region, residents may have feelings of doubt in the feasibility of an upcoming project. In Kamenicë, we encountered multiple residents who ex-

Aqueduct residents use for Irrigation.

pressed lack of optimism about UKKO's ability to gain funding for the wastewater project. Keeping open forum discussion with residents may assuage some of these doubts and raise the overall confidence of the community on program success.

Although it may be convenient for public service providers to view communities like Kamenicë as just another village, this is the very attitude that creates a gap in communication, cooperation, and mutual understanding between a utility company and its customers. Efforts to bridge this gap may be difficult, time-consuming, and expensive, but they are nevertheless necessary. Ultimately, residents of the community are the primary stakeholders of a utility company's projects; they are the ones who must deal with months of construction, pay additional tariffs, and change their living habits. Of course, development projects are meant to improve the quality of life of residents, but it is important to realize that our attitudes and opinions are a result of our perceptions. When a utility takes the time to address customer perceptions, it builds a stronger relationship with the community which can instill confidence in residents and increase the success of development projects.

Creating Value

This case study creates value for many parties associated with the project. We were able to connect UKKO with the perceptions and opinions of its customers. Providing UKKO with insight into the desires and limitations of the Kamenicë community allows the utility to implement systems that address the village's greatest concerns without crossing boundaries that would disrupt the bond of the community. This study also allows residents to recognize that their thoughts and opinions matter to UKKO. In the future, our case study can be referenced by other public service providers when they are in the processing of designing infrastructure plans for a community. They can examine the questions we asked and the research we conducted and appropriately adapt our work to their respective circumstances. We hope that UKKO is only one of many utilities to which our work will be valuable, and Kamenicë is only one of many communities that will have its voice heard. Lastly, this project has allowed each of us to gain experience in the field and discover the intersection of science and society. From one perspective, we got to see how a real-world engineering project progresses from conception to implementation. But from another perspective, we got to see the true meaning of the IQP: to experience the humanity behind our work as engineers.

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Appendices

In this Section:

Appendix A

This appendix contains a list of sample interview questions for technical and public relations UKKO employees as described in Section 2 of the Approach chapter. This sample is taken from the script of an interview with the Head of Public Relations at UKKO. In interviews with members of other departments, our questions had a focus on their area of expertise.

UKKO Public Relations and Technical Interview Script

Informed Consent Script:
We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with UKKO personnel on wastewater treatment options in the community. We believe this kind of research will ultimately lead to a more effective system that can benefit public and environmental health. Your participation in this interview is completely voluntary, and you may withdraw at any time. This interview will take approximately 60 minutes. Please remember that your answers will remain confidential. No names or identifying information will appear in any of the project reports or publications unless consent is given. Your participation is greatly appreciated. A copy of our results can be provided at the conclusion of the study. Can you now please state your name and inform your consent?

Interview Questions:

1. What is your position within UKKO?
2. How long have you been with UKKO?
3. Did UKKO ever expect to take on a greater population like it is currently?
4. Why did UKKO choose to begin their expansion with these two villages?
5. What things do you consider when you plan a new wastewater treatment facility?
6. What other organizations do you need to work with in order to develop this plan?
7. What challenges do you expect to face during this process? How do you intend to confront these challenges?
8. What has been the residents reaction to the proposed expansion?
9. Do you expect cooperation from the residents throughout the process?
10. When we get the opportunity to speak with residents, what sort of topics would be good to ask or talk about?

General Discussion Topics:

- Outline and confirm research plan over the upcoming weeks
- Week 1: Interviews with UKKO representatives, government personnel; preparation for fieldwork (site assessment strategies and preparing for interviews with locals)
- Week 2: Onsite fieldwork (site assessments, interviews with locals)
- Qualitative data from interviews will be used to make recommendations for social aspects of wastewater treatment

Appendix B

This appendix contains a list of sample interview questions/topics with the Commercial Director at UKKO as described in Section 2 of the Approach chapter.

UKKO Commercial Director Interview Script

Informed Consent Script:

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with UKKO personnel on wastewater treatment options in the community. We believe this kind of research will ultimately lead to a more effective system that can benefit public and environmental health. Your participation in this interview is completely voluntary, and you may withdraw at any time. This interview will take approximately 30 minutes. Please remember that your answers will remain confidential. No names or identifying information will appear in any of the project reports or publications unless consent is given. Your participation is greatly appreciated. A copy of our results can be provided at the conclusion of the study. Can you now please state your name and inform your consent?

Interview Questions

1. What is your role within UKKO and how long have you been here?
2. Is UKKO a for-profit organization?
3. Comparison of construction costs of cluster system and network system
4. Comparison of operation and maintenance costs of cluster system and network system
5. How are disposal tariff amounts decided?

Appendix C

This appendix contains a list of sample interview questions with the mayor of Korçë as described in Section 2 of the Approach chapter.

Mayor of Korçë Interview Script

Informed Consent Script:

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with Albanian municipality personnel on wastewater treatment options in the community. We believe this kind of research will ultimately lead to a more effective system that can benefit public and environmental health. Your participation in this interview is completely voluntary, and you may withdraw at any time. This interview will take approximately 60 minutes. Please remember that your answers will remain confidential. No names or identifying information will appear in any of the project reports or publications unless consent is given. Your participation is greatly appreciated. A copy of our results can be provided at the conclusion of the study. Can you now please state your name and inform your consent?

(continued on next page)

Appendix C (continued)

Interview Questions

1. What is your position within the municipality?
2. How long have you held this position?
3. What are your roles and duties?
4. Were you involved in the recent territorial and administrative reforms that led to the expansion of UKKO's service area?
5. What were the reasons behind the implementation of the reform programs?
6. Based on your observations and experiences thus far, how have the changes brought about by the reforms have affected the governing of the region?
7. Have any other public service expansion programs been put in place in the villages during the ongoing STAR-2 reforms?
8. Where did the funding for the program come from?
9. What level of priority does the municipality place on water supply and wastewater treatment in comparison to other public services?
10. What is the relationship between UKKO and the municipal government?
11. What level of interaction and cooperation occurs between the two parties?
12. What forms of support is the municipal government willing to provide UKKO to aid in the expansion of service coverage?
13. In the past, has the municipality developed any public education campaigns that deal with public health and safety?
14. Have there been any concerns about health issues due to undeveloped wastewater treatment infrastructure?

1. Have community members, especially from the villages, approached the municipal government with concerns about water, wastewater, or public sanitation with regard to public and environmental health?
2. Has the municipality planned any public education programs in the villages aimed towards the issue of wastewater?
3. How do you feel the residents of villages like Kamenicë would react to the installation of a wastewater treatment system?
4. Do you think the community will have a problem with paying a tariff for wastewater treatment?
5. What questions or concerns do you have about the upcoming water utility development projects?

20. What do you know about the current wastewater circumstances in the village of Kamenicë?

Appendix D

This appendix contains a list of sample interview questions used for the community interviews as described in Section 2 of the Approach chapter. In the cases where we were interviewing an individual with a specific area of expertise like the principal of the elementary school or the nurse, we put an emphasis on those areas of expertise. In these cases, we would focus on education and public health, respectively.

Sample Questions for Villager Interviews

Informed Consent Script:

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with local residents on their perceptions of wastewater in the community. We believe this kind of research will ultimately lead to a more effective system that can benefit public and environmental health. Your participation in this interview is completely voluntary, and you may withdraw at any time. This interview will take approximately 30 minutes. What you tell us will remain confidential. And your name and identifying information, such as a photograph, will only appear in our report and other publications if you agree. We really appreciate your participation. If you'd like, we can send you a copy of our study once it is completed. Do you give your consent?

Interview Questions:

Observe the interview setting; if appropriate, ask questions about our observations; ask about the participant's family and other casual questions to create a comfortable environment

- For how long have you lived in this village and in this home?
    - How has the village changed in these years?
- What do you like about living in this community?
- What is your typical day like? [This can be an indirect way of asking for the respondent's occupation, which can help us evaluate socio-economic status.]
- Do you consider wastewater treatment to be an important issue? Why?
    - Have you experienced any problems with wastewater in the village?
    - What actions would you take to change the wastewater situation?
    - Why would you take these specific actions?
- How do you think the community feels about this matter?
- Where do you currently dispose of your wastewater?
    - Did you construct the system you are using yourself?
- What do you do with the sludge in your septic tank after it becomes full?
    - How often do you empty the septic tank?
- Have you encountered any cases of illness or any other health issues related to exposure to wastewater?
- How would you feel about construction happening on your property to install new systems?
- Would you be willing to share a septic tank with your neighbors?
- Would you be willing to pay a tariff for a service that treats your wastewater?
- Would you be willing to use treated sludge as a fertilizer in your fields?

Appendix E

This appendix contains a blank interview summary sheet that we developed to help synthesize interviews as described in Section 2 of the Approach chapter. The sheet was adjusted as needed when certain interviews yielded results that were not necessarily standard or expected.

Interview Summary Sheet Template

Interviewee:

Age:

Gender:Body Language (Posture and Facial Expression):

Interviewee Description [*e.g., Community Resident]:*

Date:

Physical Setting:

Location (Region of Village):

Proximity to Identified Water Channels:

Contents of Personal Properties (House, Garden, Animals, etc):

General Observations:

Emerging Questions:

Key Takeaways:

Interview Notes:

Appendix F

This appendix contains a copy of the map which was provided during the participatory mapping activities as described in Section 4 of the Approach chapter.

Sample Mapping Exercise